Smithsonian

June 1993

The glory that was Nubia

A surge of interest in the ancient African empire (p. 90)

How to buy your first personal computer.

This year, millions of families just like yours will decide to take home their very first personal computer.

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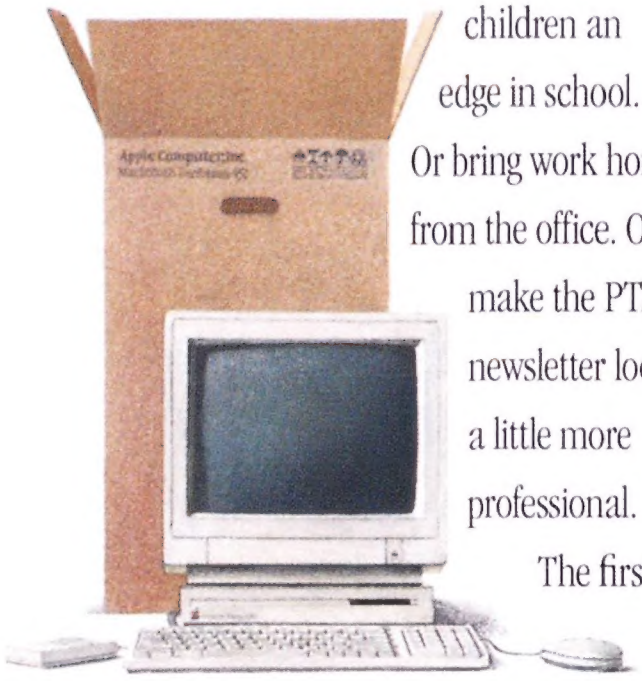

A computer should be easy to buy. So Macintosh Performa puts everything your family needs in one box.

The first step in finding the right computer is to ask a few simple questions.

What do you really need in a computer?

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Or, you can look into a new kind of personal computer: Performa.™ The family Macintosh.®

We started by putting everything together in one box, so you wouldn't have to figure out what components to buy. Plug the monitor into the computer, plug the power cord into the wall, and you're ready to go.

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A computer should help your kids to learn. Of course, more schools use Apple computers – to teach everything from frogs to Flaubert.

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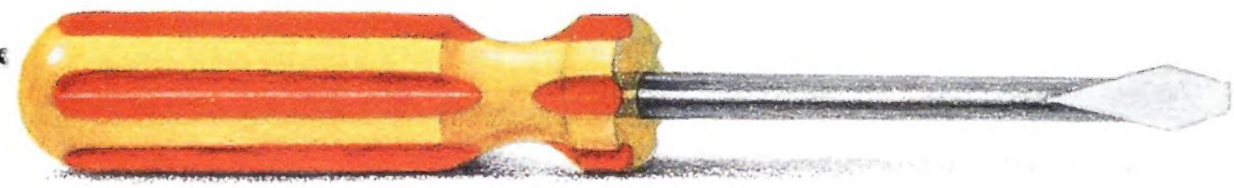
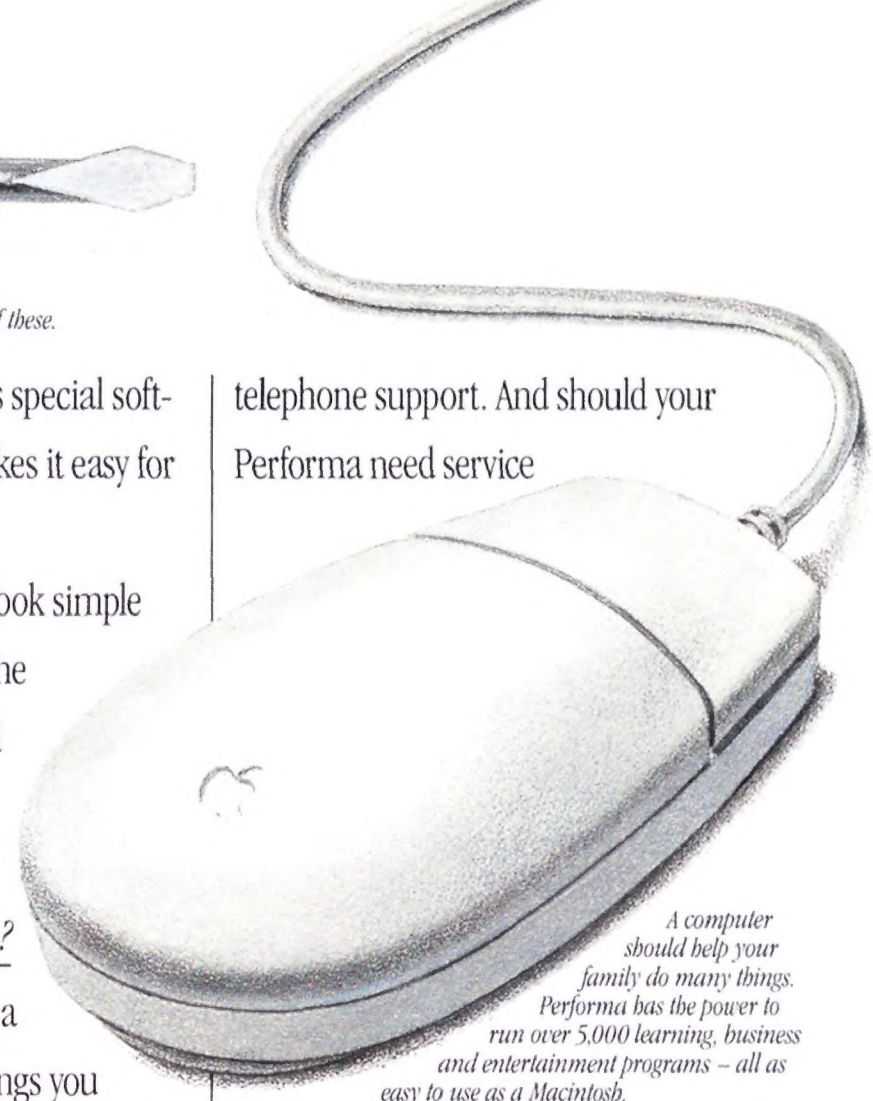
Performa is available at BizMart, Circuit City, Dayton's and Hudson's, Incredible Universe, Lechmere, Office Depot, OfficeMax, Silo, Staples, Tops, WORKplace and selected Good Guys, Montgomery Ward and Sears locations. †Modem included with the new Performa 400. 2,255 business end users at 1,145 business sites. *©1993 Apple Computer, Inc. All rights reserved. Apple, the Apple logo, Macintosh, StyleWriter and "The power to be your best" are registered trademarks of Apple Computer, Inc. At Ease and Performa are trademarks of*



A computer should be easy to set up. So a Macintosh Performa requires no tools – not even one of these.



A computer should help your family do many things. Performa has the power to run over 5,000 learning, business and entertainment programs – all as easy to use as a Macintosh.

Will everybody in the family be able to use it?

It doesn't matter how powerful a computer is if your family can't figure out how it works. Fortunately, Performa combines enough power to run a whole business with the practical simplicity of a Macintosh.

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Other computers may look simple in the store. But if you click the wrong button, you could find yourself staring at complex computer codes.

Are there any hidden costs?

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Even with the easiest computer, you may have a few questions now and then. So every Performa includes unlimited toll-free telephone support. And should your Performa need service in the first year, we'll even come to you.**

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June 1993

Smithsonian

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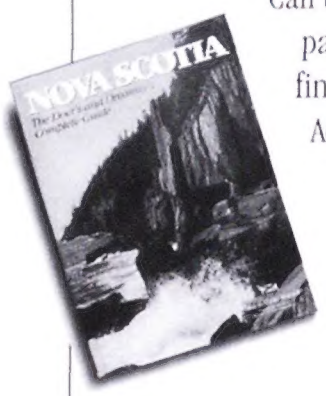

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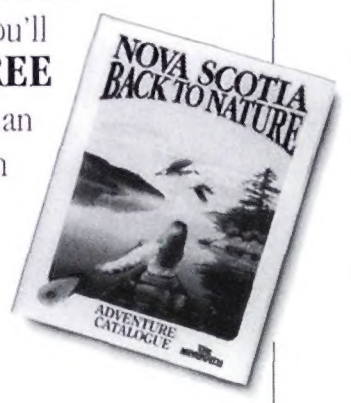

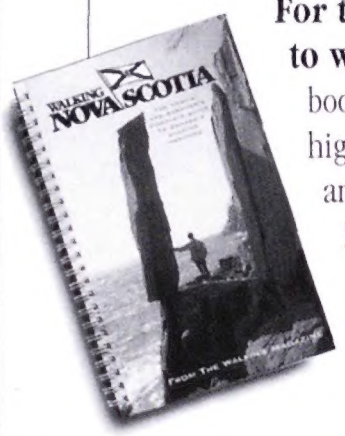

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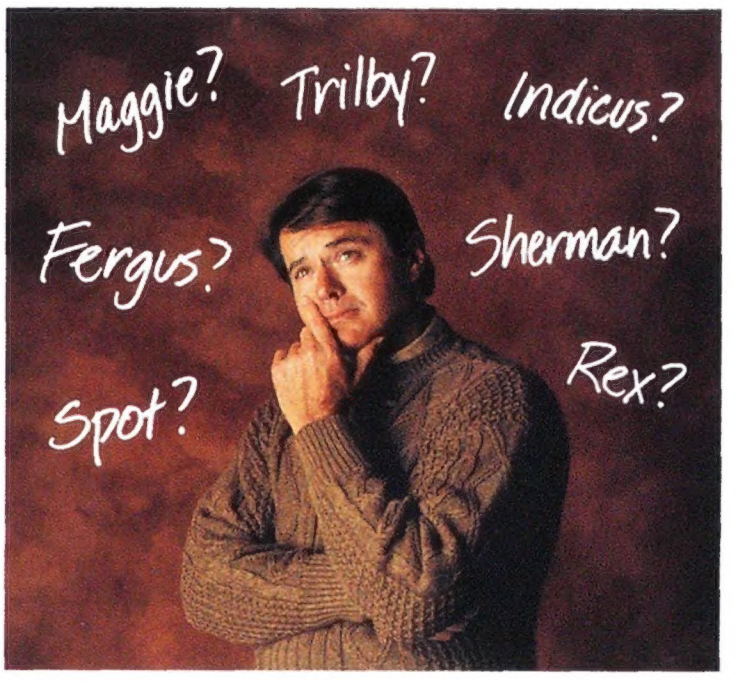
—*Robert Urich*



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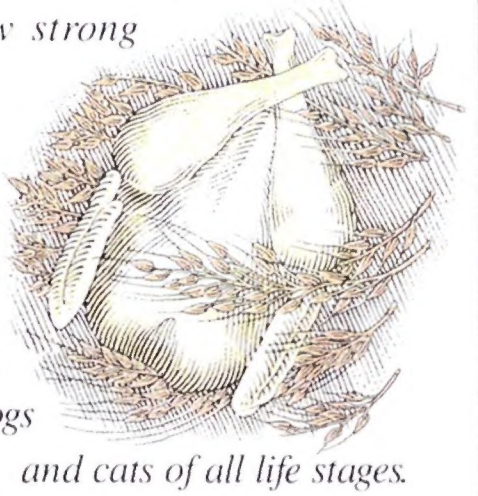

And as your pet grows, it's good to know that Purina O·N·E makes other nutritionally-complete, quality formulas for dogs and cats of all life stages.

And if you're still having trouble with a name, how about "Spenser"?

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Secretary Adams' comments

Smithsonian horizons

New studies of neotropical forests and coral reefs are providing insights of both evolutionary and contemporary value

At a spring meeting in Panama, the Smithsonian National Board has just had its first opportunity for a close look at the Smithsonian Tropical Research Institute (STRI). A unique steadfastness in the pursuit of long-range goals has characterized STRI's program there over the course of seven decades. While its research has become increasingly diverse and instrumentally complex, STRI continues to focus primarily on the evolutionary history of the Isthmus, its maritime and neotropical forest ecosystems, and the basic biology and interactive behavior of its biota. There could not have been a more appropriate setting for the Board's decision to launch a most welcome endowment-building program, the Smithsonian Fund for the Future.

As a social rather than biological scientist, I have long been particularly intrigued by STRI research that seeks out unifying themes between the seemingly self-contained terrestrial and marine divisions of its subject matter. Paleoecologist Jeremy Jackson's work on coral reefs, for example, views the dynamics of these physically monumental communities in a more general context. How closely determined is the composition of such communities, he asks. Are they, at one extreme, "mere chance associations of species that happen to tolerate the environmental conditions of the moment"? Or are they composed of species whose special characteristics encourage their coexistence, making them predictable and stable?

For short-lived organisms like insects or barnacles, Jackson recognizes that long-term monitoring by a single researcher readily permits a weighing of these alternatives. Tropical forests and coral reefs, on the other hand, can outlive such investigations by centuries or even millennia. How, then, can relatively permanent alterations resulting from variable, localized events–hurricanes, passing invasions of insect predators, and the like–be identified? One way is to substitute wider spatial sampling for temporal depth. A better one is to attack the temporal dimension directly, patiently reconstructing the fossil record. This also allows us to take into account the interacting and cumulative effects of past climatic changes.

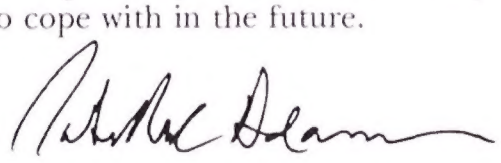
With respect to both of these approaches, the record for the world's tropics still is grossly deficient. It is also frustratingly divergent. What is known from fossils, Jackson concludes, appears to provide "compelling evidence for long-term stability of coral reef communities." Short-term studies of spatial variability, on the other hand, strongly suggest that the composition of the reefs is "fundamentally unstable on the relatively short time scale of human lifetimes."

The same divergence of short-term and long-term perspectives can be found in accounts of forest succession as the great North American glaciers retreated northward at the end of the Pleistocene. Should that process be approached (and understood) primarily as independent movements of discrete species in response to ameliorating local circumstances? Or do we need to define a "dynamic equilibrium" in which a larger ensemble of forest species responded to direct, large-scale climatic forcing as well as to each other?

Beyond its evolutionary importance, the issue has contemporary relevance. Massive human disturbances currently threaten to induce significant global warming. For the present, most of us have been content passively to await greater certainty on the likely extent of the change. Some effort, to be sure, also is beginning to be devoted to the examination of mitigating and adaptive measures that may one day be needed. But although we naturally tend to think first of the impact of future warming on the quality and continuities of human life, its potential consequences for the destruction or displacement of natural ecosystems are in the long run no less vital.

To learn more of how this may happen, we need much more study of that longer, frequently fossil-dependent time dimension. Major, extraordinarily rapid temperature changes, it is becoming increasingly clear, have repeatedly occurred in the past. New methods permit their extent and duration–and closely associated shifts in plant communities resulting from them–to be measured with considerable precision. Those comparative insights will be invaluable as we confront a murky future whose principal dangers will be largely of our own making.

Paul Colinvaux is another STRI scientist who currently devotes his time to taking cores from tropical lake beds in order to clarify those ancient changes. As he has rightly observed of humankind, we are the only species that has found the means to invade every ecological niche at will without adapting our behavior to new constraints that recognize the consequences of our actions for the entire living world we share. For this reason above all, uncovering the prevalence of change on every time scale in the past does not invite complacency about what we may have to cope with in the future.



Thankfully, the world has one resource that will never be exhausted: the Spirit of Enterprise.

The Rolex Awards for Enterprise were conceived in 1976 to recognize individuals who have displayed a remarkable spirit of enterprise in the fields of Applied Sciences and Invention, Exploration and Discovery, and the Environment. Since the Awards were introduced, 30 individuals have each received 50,000 Swiss francs and a specially inscribed Rolex Chronometer timepiece. Rolex is proud to announce the five new winners for 1993:

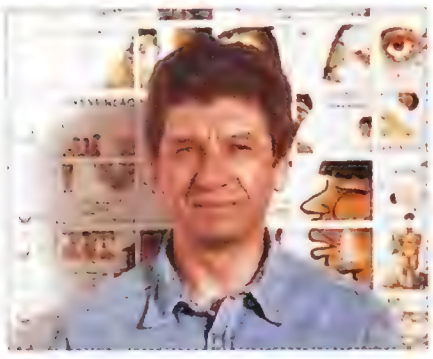
STEVEN GARRETT, a physics professor, has developed a revolutionary system of refrigeration that does not contain the chemicals used in most refrigeration equipment, which we now know harm the ozone layer.

This unique refrigeration method has grown out of the science of thermoacoustics. Garrett's device exploits this science, utilizing sound to transfer heat and thus produce refrigeration. A prototype has already been tested on board the space shuttle *Discovery* in 1992. Garrett sees his award as being important because not only will it attract more physicists to work in this largely unknown area, but also "it will draw attention to these alternative technologies."

FORREST M. MIMS III is an entirely self-taught electronics specialist who has developed an instrument capable of measuring the thickness of the ozone layer. He has named it TOPS: Total Ozone Portable Spectroradiometer.

What makes this machine remarkable is the fact that it is about 500 times lighter and 200 times cheaper than existing detectors; yet its readings are highly accurate – vital information in this time of growing concern for the ozone layer.

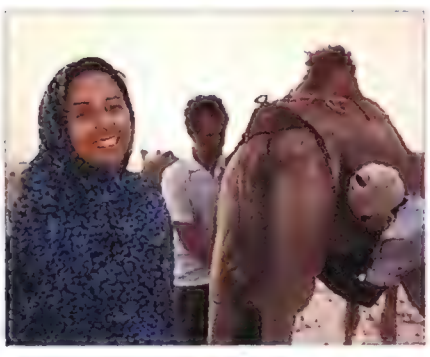
It is Mims's aim to distribute TOPS to individuals in at least 10 countries, forming a network to complement measurements taken by the small number of official monitoring stations.



ALDO LO CURTO describes himself as a "traveling volunteer doctor." Since finishing his medical studies, he has spent his holidays traveling to remote parts of Africa, Asia, and the South Seas, giving free medical care to the people there.

In 1981, he went to South America to work with the Amazonian Indians. He studied their plant-based remedies, and wrote a manual for health workers which combined Western and Indian medicine.

This extraordinary book will be a valuable guide for health workers. For the Indians, it will serve as a reminder for future generations of the knowledge of healing accumulated by their ancestors. He will use his award to publish the first edition.



NANCY ABEIDERRAHMANE has taken the enterprising step of setting up a dairy in Mauritania, a country noted more for its desert than its pastures.

This is no ordinary dairy, however, since it specializes in pasteurizing camel's milk supplied by seminomadic herders.

The milk Nancy is processing is highly nutritious, and because it is pasteurized, it is healthier than the raw milk commonly drunk by the local population.

With the award, Nancy's next step is to produce cheese from camel's milk, thus adding to the improvement of the local diet.

ANTONIO DE VIVO is an Italian physical education instructor and a leading cave explorer. In an expedition prior to winning this award, De Vivo traveled down the La Venta River in Mexico and made some extraordinary discoveries, including a remarkably well-preserved Mayan altar. His expedition also studied the flow of water in the river and cave systems, in the hope that his research could help villagers a few miles away to make use of the water for drinking and irrigation.

This award will allow Antonio De Vivo to return to the area, to study further the archaeology of the caves in the hope of finding the entrance to a long-lost Mayan city.

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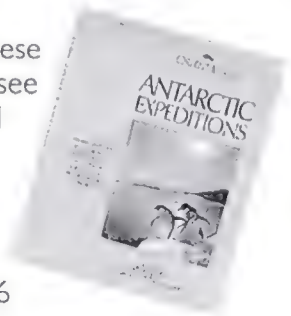

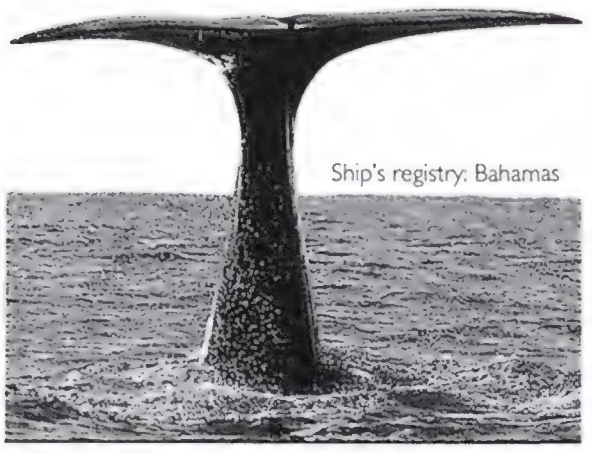

Letters to the Editor

Holocaust Memorial Museum

Dear Sir: Commenting on your April cover story, there is no doubt that establishment of the Holocaust Memorial Museum in Washington will play an important role in helping the general public, and especially the younger generation, comprehend the truth about the extermination of the Jews. It was perpetrated solely by Nazis during World War II, in concentration camps, the majority of which were set up in the German-occupied parts of Poland.

Unfortunately, when speaking about the camps, the author of the article uses an inappropriate and misleading term, "Polish camps." How many times is it necessary to point out that the Holocaust was executed in the Nazi death camps?
Kazimierz Dziewanowski
Ambassador, Republic of Poland
Washington, D.C.

Dear Sir: It is right and fitting that the United States should have a Holocaust Memorial Museum, and that it commemorate the unspeakable in man's inhumanity to mankind, which has occurred in many places–and which still is occurring. Without such memorials to stand witness, it would be too easy to forget and allow history to be repeated.

I was saddened to note only one brief reference to others besides Jewish people who suffered the Holocaust. I hope the memorial gives due and specific emphasis to the Gypsies, the other religious groups, the homosexuals and others–lest we or our children forget that tolerance of *all* people with whom we may not agree is of the utmost importance.
John W. McKenna
Glendale, California

Dear Sir: The Holocaust destroyed American lives as well as those of millions of European Jews and other minorities. As a former American POW in Stalag IXB, I can personally attest that Jewish American soldiers were separated from the rest of us and sent to a slave labor camp. I later found that few survived.

I shall not forget it and I hope no one else does.
Richard Lockhart
Chicago

Bioremediation

Dear Sir: Your article creates the impression that the use of bacteria as the active ingredient in pollution abatement is a relatively new development. It isn't.

Boning up for a Boy Scout merit badge examination in the late 1920s or early '30s, I discovered that the Milwaukee sewage disposal plant passed the raw material alternately through agitator tanks, so aerobic bacteria could work on it, and settling pools, so anaerobic bacteria could have their innings. Then most of the water was wrung out, and the stuff was bagged and sold as Milorganite, a fertilizer. It is still sold, but with a warning that it shouldn't be used for food crops, as bacteria can't digest the heavy metals that our culture seems to generate in large quantities.
Frank V. Holan
Putney, Vermont

National Historic Landmarks

Dear Sir: My father, William Wininger, was responsible for the painting and decorating of the interior of the West Baden Springs Hotel. Many notables frequented it. Al Capone was a constant visitor. Rogers Hornsby of the Chicago Cubs landed his plane on the golf course.

Fifty miles from Louisville, Kentucky, the hotel at "Derby Time" overflowed with visitors from all parts of the nation and the world.

The large, unsupported roof over the atrium is set on rollers that enable the structure to sway in times of exceptional wind velocity, protecting it from damage. The conelike protrusion in the center of the atrium (pp. 130-31) supported an orchestra stage that could be lowered to the floor.
Ray Wininger
Salt Lake City

Dear Sir: I was quoted as calling that dynamo of preservation, Carolyn Pitts,

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"gruff." I can just hear her now–"Gruff. GRRUFF! Wadyamean, 'Gruff'?"

As a bow to the sunny side of her nature, not to speak of her work, her pursuit of integrity of style and authenticity in detail, here is Miss Pitts [below] conducting research in Granada into the origins of Moorish Revival.

David Sellin
Washington, D.C.

Dear Sir: I'm all for individuals and communities making the first move. Our society owns two historic houses of architectural importance and operates both as museums. They were saved and restored by local effort. One was purchased with help from the Department of the Interior, but the thrust came from here, and one has been awarded National Register status.

In spring we show 500 elementary students through our houses. If teachers and children were grounded in the importance of local history, preservation and landmarking would be taken care of.

Joyce M. Besson, Administrator
Zelienople Historical Society
Zelienople, Pennsylvania

Dallas/Fort Worth Airport

Dear Sir: You have a misspelling. Our city is "Fort Worth" and not "Forth Worth" as on page 36 of your article.

Mrs. M. H. Meyer
Fort Worth

Mrs. Meyer is correct. Our copyeditors have volunteered to lie down on Runway 18 right and 36 left–forthwith. Ed.

Luddites

Dear Sir: My cover's been blown. For years I used "Ned Ludd" as a pseudonym for letters to editors, on name tags, et cetera, and only once was someone suspicious. I was only trying to keep Ned's legacy alive.

The author clearly understands the dualistic role of technology today, but his examples (such as CD players and laser printers) are hardly items affecting the majority of the work force. Each year thousands of industrial workers are displaced by more "efficient" means of production, and often face service industry jobs while awaiting their savior, "retraining." Retraining started in the days of Ned Ludd, but now there is one difference. What is everyone going to be retrained to do?

Any article about the Luddites cannot be divorced from present-day social consequences of increasing mechanization.

Peter Montesano
Anchorage, Alaska

Dear Sir: In the *Midlands?* No, Sir!

I was born and raised in the very small area in the north of England where the Luddites fought; I have Luddite ancestors and was fed Luddite lore with my baby food. My family, down to and including my father, were woolens manufacturers.

The Luddite revolt was in the North. *Midlands* is Birmingham. Leeds, Manchester, Liverpool, are in the North. This is not unlike an English person referring to a Virginia gentleman as a Yankee.

Pamela Judson-Rhodes
Princeton, New Jersey

Snapping turtles

Dear Sir: About 40 years ago we owned a cabin on the banks of the Tippecanoe River, near Warsaw, Indiana. One day two men in sneakers and jeans, wading the river with gunnysacks tied to their waists, were using stout sticks to prod the subsurface soft mud along the banks. When the "feel" was right, they reached down quickly, pulled up a snapping turtle and popped it into a sack.

They were taking the turtles back to Muncie, for a fried turtle feast for fellow members of a fraternal organization.

Hurley Gerard
Bella Vista, Arkansas

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The object at hand

The "voice heard once in a hundred years" rose above racial prejudice in 1939 to sing at the Lincoln Memorial

Easter Sunday, 1939: the great contralto Marian Anderson stands on the steps of the Lincoln Memorial in a full-length mink coat, clasps her hands before her, closes her eyes and sings, "My country, 'tis of thee, Sweet land of liberty. . .." and 75,000 Americans, packed around the steps and spread along the sides of the Reflecting Pool, stand frozen in awed silence.

An electrifying moment in the generally shabby racial history of our country. For Marian Anderson, the black singer who, Arturo Toscanini said, had a "voice heard once in a hundred years," had been barred by the Daughters of the American Revolution from performing in Constitution Hall in downtown Washington. The city's school board also had denied her the stage of then whites-only Central High School. It cited the singer's request for a $2,000 guarantee, which she later waived.

Outrage reverberated around the world. Eleanor Roosevelt, the First Lady, swiftly and furiously resigned from the DAR. Mass meetings were held in the capital, and thousands signed petitions condemning the school board's action.

And so Harold Ickes, Secretary of the Interior, offered Anderson the grand outdoor space of the Lincoln Memorial–the American people's holiest political sanctuary–inaugurating a tradition carried on by Martin Luther King jr. and, just this year, by President-elect Bill Clinton.

Parts of Marian Anderson's brief concert were broadcast nationwide and appeared in newsreels. It is a curious fact that virtually everyone who saw those newsreels remembers the fur coat. Was it that we hadn't expected to see a black person wearing such a symbol of wealth and success? Or was it simply the majestic sweep of that handsome dark fur as the supremely dignified woman drew herself up to sing?

Marian Anderson herself is no longer with us. She died this year, just before Easter, at the age of 96. (The books say she was born in 1902, but such was her stately beauty that she was able to fudge her age by five years.) The fur coat is still around. In 1992 it was donated to the Smithsonian's Anacostia Museum by Anderson's nephew, James DePreist, for the past 13 years conductor of the Oregon Symphony.

"When we were moving her from her home in Connecticut to be with us in Oregon," DePreist says, "we found seven of her furs. Most of them were in terrible condition, but there were three that could still be called coats–and one of them was a long black mink."

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Marian Anderson, in her mink coat, sings to the nation as Lincoln looks on.

The coat in the Anacostia Museum is lined with grayish tan silk trimmed in elegant gold tracery. The fur-trimmed hat that the singer removed before the concert is not here. But it is the coat that we remember. And the voice.

Marian Anderson began singing in the grown-up choir of Philadelphia's Union Baptist Church at the age of 8. Church members collected money to pay for her voice lessons, and while still in her teens Anderson attracted the notice of the legendary black tenor Roland Hayes. In 1925 she won national attention by placing first among 300 singers in a competition to perform with the New York Philharmonic. Armed with a small scholarship, she made her European debut in Berlin five years later. But her breakthrough concert, bringing her world acclaim, did not come until 1935 in Salzburg, Austria. It was on that occasion that Toscanini made his celebrated pronouncement.

By the time of the Washington incident, Anderson was giving 70 concerts a year as one of the most successful recital artists in the nation. She still had trouble getting first-class accommodations. And her debut as the first black to sing at the Metropolitan Opera was not to come until 1955, a year after the Supreme Court school desegregation decision. She sang in Verdi's *Un ballo in maschera* (*A Masked Ball*) that time and, as usual, won an ovation. By then she was 57 years old, past her singing prime and within ten years of her farewell concert tour–which would begin, appropriately, at Constitution Hall.

As for the DAR, it was never quite the same after that 1939 episode. The group insisted at the time that they'd refused Anderson use of Constitution Hall on Sunday, April 9, because the National Symphony Orchestra already had reserved the date. (There was no Kennedy Center then, of course. Washington was still very much a sleepy Southern town.) But Sol Hurok, the pioneering impresario who managed Anderson, said that "we learned later on good authority that April 8 and 10 were open to 'white artists.' We applied for either of those dates and again were turned down."

At the time, Anderson said she was not surprised that Mrs. Roosevelt had quit the DAR. "She seems to be the one who

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really comprehends the true meaning of democracy," she said. "I am shocked beyond words to be barred from the capital of my country after having appeared in almost every other capital in the world."

DAR policy allowed blacks in the audience but not on the stage. Its officials said they were only conforming to "customs existing in the District of Columbia," and in truth the District was segregated well into the '50s, though, unlike the DAR, other theaters allowed blacks to perform onstage but not attend.

In 1941 singer Paul Robeson was barred from giving a war benefit concert in Constitution Hall, but two years later Marian Anderson was at last allowed to sing there, raising nearly $8,000 for United China Relief. As late as 1946, however, pianist Hazel Scott was denied an appearance in the hall. The "white artists only" policy was reaffirmed by a board vote in 1947 and lasted until 1952.

As one shyly strokes the famous mink coat, now packed in a storage box at the Anacostia Museum, it seems to have an eerie presence: like Proust's madeleine, it recaptures things past.

People had been waiting since noon on that crisp, cloudless Easter, most of the women decked out in their brightest colors and flowered hats. Anderson was greeted by a huge crowd at 1:25 P.M. at Union Station, then driven to the Rhode Island Avenue home of Gifford Pinchot, former governor of Pennsylvania. Her mother, Anna Anderson, and two sisters accompanied her.

She came to the Lincoln Memorial in a black limousine around 4:30. By that time the throng extended down the sides of the Reflecting Pool. The papers reported that the Capital Transit Company had laid on 24 extra buses and 39 extra trolley cars to handle the traffic headed for the Lincoln Memorial that day.

The minute the singer appeared on the green-carpeted platform, the crowd started to cheer, and the roar swelled as she mounted the steps and retired into the Memorial. Police had to keep the crowd from following her right in there.

Harold Ickes, stumpy and balding and fierce, scowling with purpose behind his rimless glasses, introduced her as one of those whom "genius touched with the tip of her wing." He said, "In this great auditorium under the sky, all of us are free." He said, "There are those, even in this great capital of our democratic republic, who are either too timid or too indifferent to lift up the light that Jefferson and Lincoln carried aloft." That was how people talked in those days.

Then, as Congressmen and Cabinet members and the sea of citizens before her watched, she clasped her hands in her trademark gesture, letting her coat fall open to reveal a long velvet gown. And sang "America."

Late arrivals in the crowd stopped in their tracks. Some bared their heads.

She followed with a Donizetti aria, Schubert's "Ave Maria" and three spirituals, which at the time were expected of black singers, operatic or no. She was famous for her rendition of spirituals, often creating an almost religious hush in the audience, "a silence instinctive, natural and intense," writer Vincent Sheean said, "so that you were afraid to breathe."

There was an encore. There had to be. She sang, "Nobody Knows the Trouble I've Seen." Local reviewers were astonished by her range.

The crowd wouldn't let her go. She waited on the platform for the applause to die. Her accompanist, Kosti Vehanen, closed the piano lid. Still they applauded, until she came to the battery of microphones once more.

"I'm not a speaker," she said. "I'm just so overwhelmed today, I cannot express myself. You don't know what you've done for me. The immensity of this affair has done so much to me, I'm not up to giving a nice speech. I thank you from the bottom of my heart, again and again."

The cheering redoubled. Hurok kissed her hand.

One of the white officials who escorted her from the Lincoln Memorial was Oscar L. Chapman, Ickes' Assistant Secretary, who was credited with having originated the idea of the outdoor concert. For a few minutes, black and white leaders mingled there under the gaze of the stone President: Walter A. White of the NAACP, John P. Davis of the National Negro Congress, Howard University officials, Associate Justice Hugo Black of the Supreme Court, Secretary of the Treasury Henry Morgenthau jr., and U.S. Senators from Pennsylvania, New York, Vermont, Kansas, Ohio and Missouri.

Maybe the Marian Anderson concert has been overpraised as a shining moment in American race relations. It was still a long way to 1954, let alone to the decade of Martin Luther King jr. and Malcolm X. But it was a wake-up call to people everywhere, that seems certain.

Michael Kernan

Smithsonian highlights

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Extended summer hours

Starting Monday, June 14, through Labor Day, Monday, September 6, the National Museum of American History, the National Museum of Natural History and the National Air and Space Museum will operate on extended hours daily, 10 A.M. to 6:30 P.M. Hours at the National Zoo are 9 A.M. to 4:30 P.M. daily for buildings, and 8 A.M. to 8 P.M. for grounds. Other Smithsonian museums are generally open from 10 A.M. to 5:30 P.M. daily.

Festival of American Folklife

The 27th annual Smithsonian Festival of American Folklife will be held on the Mall July 1-5, from 11 A.M. to 5:30 P.M. This year's festival, cosponsored by the National Park Service, will feature programs on the "culture of the Borderlands," social dance in America, music from the metropolitan Washington, D.C. area and urban children's folklore. Events will include craft demonstrations, performances, storytelling, cooking.

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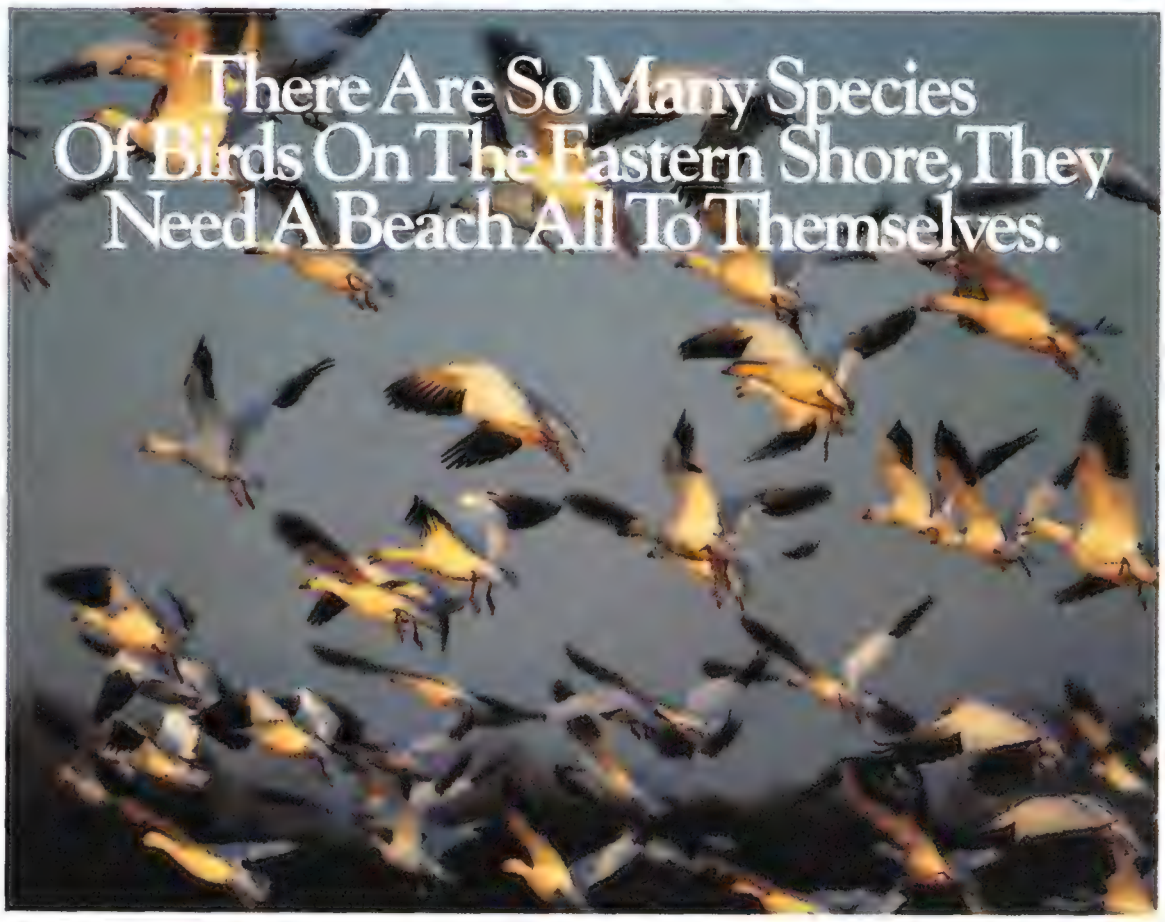

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Special June exhibits, events

National Museum of American Art
American Art at the 1893 World's Fair (through August 15) Exhibition brings together 100 of the American paintings and sculptures that were displayed at the 1893 World's Columbian Exposition in Chicago. See page 38 and *Highlights continued* on page 22. Show is held jointly with the National Portrait Gallery.
American Impressions: Masterworks from American Art Forum Collections, 1875-1935 (through July 5) Masterpieces of American art by such artists as Albert Bierstadt, Georgia O'Keeffe and Edward Hopper.

Renwick Gallery
American Wicker (through August 1) Exhibition traces the history and stylistic evolution of American woven furniture from 1850 to 1930.

National Portrait Gallery
American Art at the 1893 World's Fair (through August 15) See listing under National Museum of American Art.
Recent Acquisitions (June 10-January 9, 1994) Portraits of notable Americans selected from recently acquired works.

National Museum of African Art
Dreaming the Other World (June 9-September 9) Exhibit examines the belief of the Baule peoples of central Côte d'Ivoire in mirror-image, or "Other World," mates.
Astonishment and Power: Kongo Minkisi and a New World Resonance (through January 2, 1994) Exhibition explores both the *minkisi* tradition of the Kongo peoples of central Africa and the contemporary art of Renée Stout, an African-American artist who draws on their traditions.

Arthur M. Sackler Gallery
Joined Colors: Decoration and Meaning in Chinese Porcelain (through November 28) Exhibit of 15th- through 19th-century polychrome porcelains.
The Golden Age of Sculpture from Sri Lanka (through September 26) Exhibition of 52 ancient masterpieces of bronze casting includes many of the major monuments of Sri Lankan art.

Freer Gallery of Art
Newly renovated and reinstalled galleries feature Asian and 19th- and early 20th-century American art, including the world's most important collection of works by James McNeill Whistler.

National Air and Space Museum
A "Blueprint for Space" (through April 1994) Exhibit showcases collection of artworks of space imagery commissioned in the 1950s by *Collier's* magazine.
Where Next, Columbus? New gallery looks ahead to the next 500 years of explora-

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tion and examines a variety of issues involved in future space travel.

National Museum of American History
The Past as Memory and Model (through June 28) Display commemorates opening of the U.S. Holocaust Memorial Museum.
Beyond Category: The Musical Genius of Duke Ellington (through September 6) Exhibit organized by NMAH and the Smithsonian Institution Traveling Exhibition Service looks at the 50-year career of the celebrated composer, bandleader.

National Museum of Natural History
Dinosaurs...A Global View (June 5-September 30) Lifelike sculptures and detailed paintings trace the evolution of dinosaurs over millions of years.
EarthSense (through September 6) Exhibition of photographs focuses on global efforts to safeguard our fragile planet.

National Zoological Park
Amazonia New permanent installation recreates a microcosm of the world's largest rain forest and river habitat, and explores the wonders of this richly diverse ecosystem.

Hirshhorn Museum & Sculpture Garden
Jean Dubuffet, 1943-1963: Paintings, Sculptures, Assemblages (June 17-September 12) Exhibition features some 100 works, including portraits, sculptures (see page 78).
Directions–Alison Saar (through July 25) Life-size figures and found-object icons by the New York artist are inspired by African-American culture.

International Gallery, S. Dillon Ripley Center
Shared Visions: Native American Painters and Sculptors in the 20th Century (through October 3) Exhibit showcases the "best of the best" in native-American art.

Anacostia Museum
Body and Soul: The Alvin Ailey American Dance Theater (through June 13) Exhibition celebrating the 35th anniversary of the distinguished modern dance company features costumes, posters, programs, and original costume and prop designs by Romare Bearden and Randy Barcelo.

Cooper-Hewitt Museum (New York)
Design and Fabric Technology: Pushing the Limits (through September 26) Exhibition examines recent groundbreaking collaborations between artist-designers and fabric producers.

Exhibition catalogs

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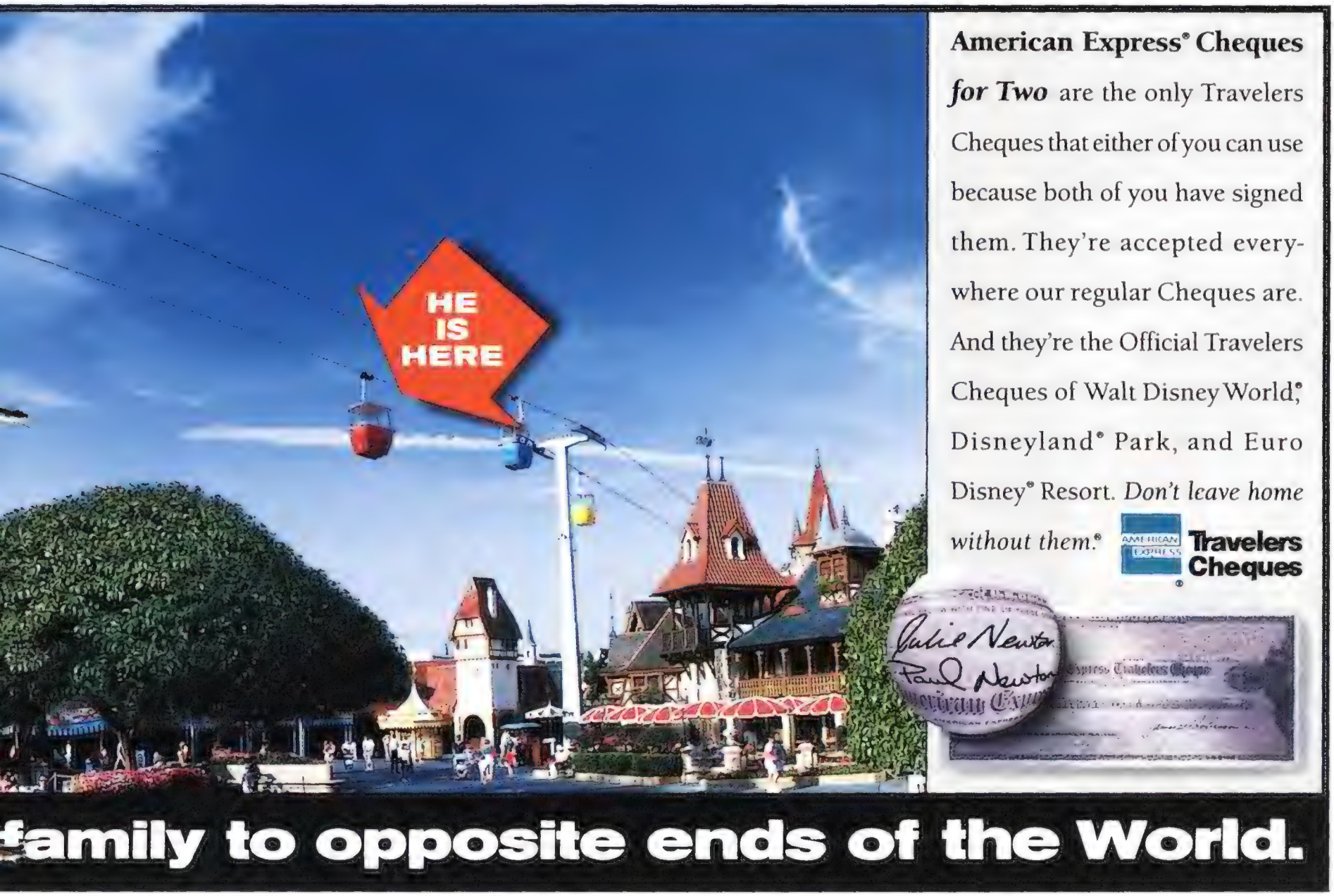
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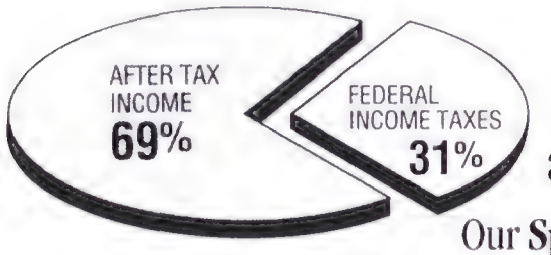

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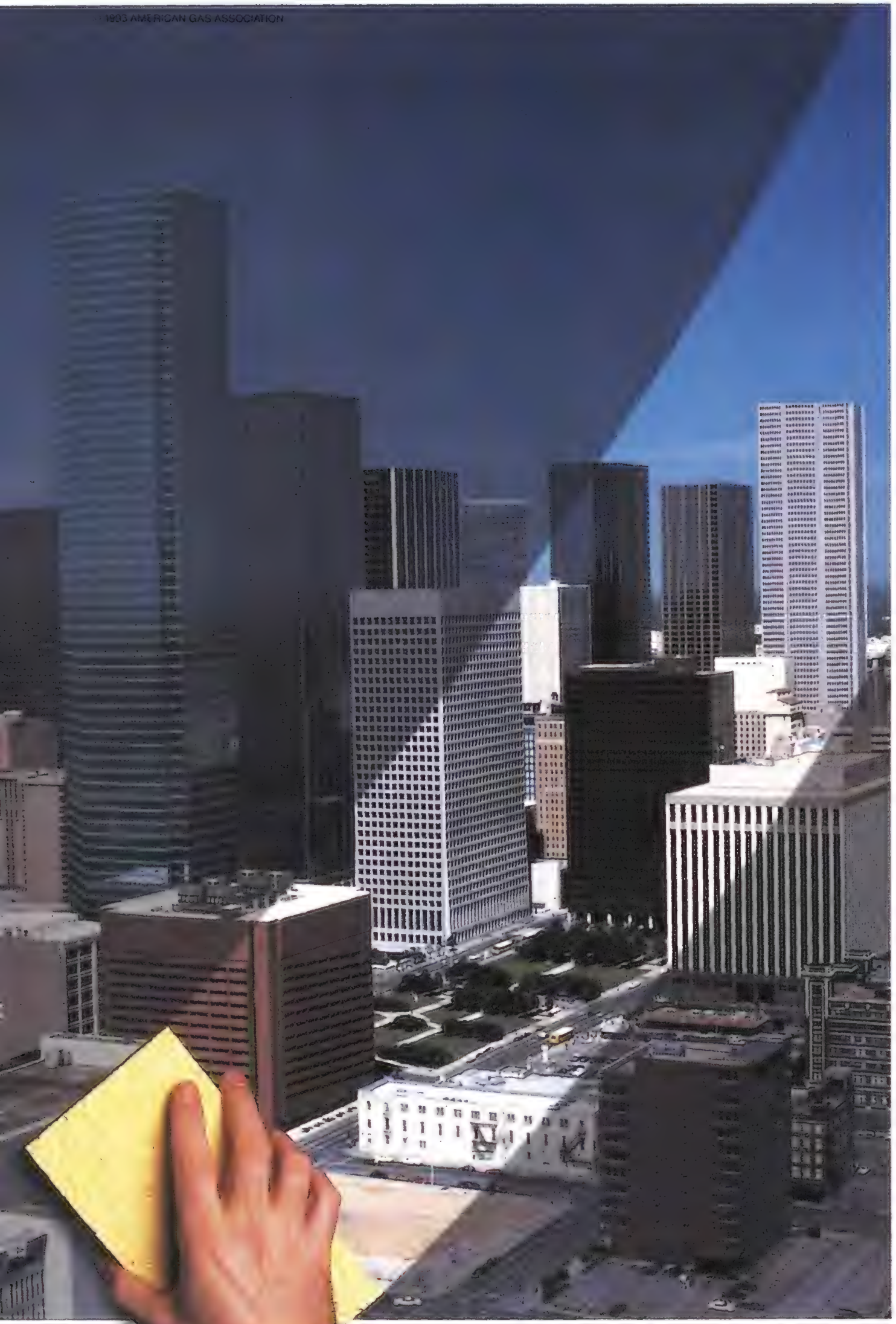

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Highlights continued

American art at the 1893 World's Fair

A rare opportunity to see part of the 1893 World's Columbian Exposition (article on page 38) awaits visitors to a major new exhibition at the National Museum of American Art and the National Portrait Gallery. "American Art at the 1893 World's Fair," on view through August 15, was organized jointly by the two museums and features 100 of the 1,184 American paintings and sculptures originally shown at the Chicago fair.

According to curators Carolyn Carr of NPG and George Gurney of NMAA, this exhibit "will provide a tangible glimpse into a moment of great artistic ambition in our nation's past." The works in the show are distinguished for their technical achievement and enduring appeal. From theatrical historical paintings to intimate genre scenes, they also offer a fascinating insight into late 19th-century intellectual and cultural attitudes.

The 1893 fair "was a watershed in American visual arts," maintain museum directors Elizabeth Broun, NMAA, and Alan Fern, NPG. Its legacy was the assertion that American art "could stand beside manufacturing, transportation, and commerce as a national achievement." As painter Will Low put it, "Then for the first time we awoke to a realisation that art of the people, by the people, for the people had come to us . . . not as a single growth, but as the triple flower of architecture, painting, and sculpture."
Diane M. Bolz

George Hitchcock's *Tulip Culture, Holland* (1887) was first shown at the 1887 Paris Salon and last seen publicly in 1893.

Painted by Julius LeBlanc Stewart in 1890, *On the Yacht Namouna, Venice* captures sumptuous lifestyle of the elite.

F. D. Millet, director of decorations for fair, did *Lacing the Sandal* in 1885.

James McNeill Whistler considered his painting *The Chelsea Girl* (detail) a sketch.

Portrait of artist F. D. Millet in Russian military garb is by George W. Maynard.

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By James Trefil

Dark Matter

We can't see it or touch it, and we don't know what it is, but it may determine the fate of the Universe

Dark matter is strange stuff. It's all around you but you can't see it. It's whistling by your ears but you can't hear it. It is arguably the most important material in the Universe, but until recently scientists had no idea that it existed. It will decide the fate of the Universe, but we have no idea what it is. How can scientists, after so many centuries, still know so little about the workings of the cosmos?

When you look out into the sky from planet Earth, you see lots of things–the Moon, other planets, the occasional comet and the stars of the Milky Way. In between these occasional solid bodies, we used to think, was the void. A little dust here, a little gas there. But basically emptiness.

Well, the Universe just doesn't look that way anymore. As seen by the modern astronomer, that space between the planets and stars is no longer empty, and it isn't just populated by the odd dust grain or elementary particle, either. It's filled with something called dark matter–something whose effects we can see, but whose distribution and identity we have yet to learn.

It all started back in 1933 when the Swiss astronomer Fritz Zwicky was working at Caltech measuring the motion of galaxies in a region called the Virgo Cluster. This is a group of 100 or so bright galaxies located about 64 million light-years from Earth in the constellation Virgo. He measured the speeds at which the various galaxies were waltzing around one another, as well as the total amount of light the galaxies were sending out into space. From the latter, he could estimate how many suns there were in those galaxies, and hence how much mass there was in the cluster. From the velocities, on the other hand, he could estimate how much mass it would take to keep those swiftly moving galaxies from flying off and leaving the cluster. Then came the surprise–in his words "the total mass [of the cluster] considerably exceeds the sum of the masses of individual galaxies."

Isaac Newton taught us that every object in the Universe exerts a gravitational force on every other object. If you threw this magazine up into the air, Earth's gravitational force would slow its upward climb, stop it and make it fall back down. Knowing the mass of Earth (and hence the gravitational force it is capable of exerting) and the speed of the magazine, you could make that prediction with absolute certainty. If you threw the magazine fast enough–faster than seven miles per second–you could also predict with absolute accuracy that, despite Earth's gravitational pull, the magazine would never come back down. You would then say it had reached escape velocity.

What Zwicky discovered about the Virgo Cluster was that if the mass of the cluster is just the sum of the masses of the stars in the galaxies, then all the galaxies he could see had escape velocity. Like steam from a drop of water on a hot griddle, they would all have evaporated from the cluster long ago, leaving a blank spot in space. The fact that the cluster was still there meant that there had to be more mass pulling the galaxies back in–matter that wasn't visible in Zwicky's telescope.

Astronomers filed Zwicky's discovery with those bothersome but unexplainable bits of data that exist in every branch of science. The assumption was that sooner or later someone would explain it, so there was no point in getting too excited. But today, looking back, we can see that Zwicky had stumbled onto one of the great secrets of the Universe–that most of what's out there can't be seen. Only in the past 15 years or so has this fact been seized upon as a possible answer to many of the problems we face in explaining how the Universe came to be as it is today and in predicting what will happen in the future.

We have studied the stars and galaxies for millennia, but the bulk of what is out there remains a mystery.

In 1933 Fritz Zwicky found that without unseen matter, the Virgo Cluster of galaxies would have flown apart.

The best analogy I can give to what has happened in astronomy over the past decade and a half is this: suppose you were standing by a stream watching a couple of twigs floating by. Suppose further that the water was invisible to you–that all you could see were the twigs. If those two twigs moved toward each other, you might well decide that what was moving them was their mutual gravitational attraction. But if you took this tack and then calculated how big the gravitational force between the twigs was–how hard they were pulling on each other–you would quickly find that it wasn't nearly big enough to explain what you were seeing. Eventually, you would have to accept that there was something else exerting force, something you couldn't see directly, but the influence of which was manifest in the movement of the twigs. Once you had accepted this, you could do two different things to investigate this strange stuff. You could look at lots of twigs and discover that they moved only in a certain region (those on the ground, for example, would not move at all). In this way, you could draw a rough map of where the water in the stream was. You could also reach down into the stream and try to get a handful of the invisible stuff acting on the twigs, so that you could investigate its properties.

What is this stuff and where is it?

Astronomers today are carrying out both kinds of studies. They are looking into the Universe to find out where dark matter is and designing experiments to find out what it is. The first modern look at where it is came in the late 1970s, when astronomers began making detailed studies of rotation of other galaxies. If you think of a galaxy like our own Milky Way, you probably conjure up a picture of a giant pinwheel of stars, majestically turning in empty space. Each star can be thought of as moving around the center of the galaxy in a large orbit–the Sun, for example, takes about 250 million years to make it once around. The rotation is actually a fairly complicated business, because each star has a gravitational effect on all of its neighbors and is, in turn, affected by them. The net result of all of this gravitational to-and-fro is easy to describe (if complicated to work out mathematically) for stars not too close to the galactic center. As long as a star is part of the pinwheel–so long as it is immersed in the gravitational fields of its fellows–it will move at the same speed as all the other stars.

This doesn't mean that the whole galaxy turns like some sort of cosmic merry-go-round. The farther out a star is, the farther it has to travel to make one loop around the galaxy, and hence the longer it will take. Like a group of runners on a curved track, a star on the inside will move ahead of its more distant fellows, even though they are all traveling at the same speed.

It's important to understand that this kind of rotation

In the majestic rotation of a galaxy, everything is gravitationally linked and moves at the same speed. Hydrogen atoms beyond the spiral do the same, showing they are embedded in the gravity of unseen matter.

is very different from the sort of thing we see in our own solar system, where the outer planets not only have farther to travel than the inner ones, but travel more slowly as well. That sort of motion is characteristic of situations in which objects are far away from a large, central object like the Sun, and is markedly different from the way things move if they are immersed in a sea of gravitating bodies–"down in the soup," as it were.

In the 1970s, astronomers had refined their techniques to the point that they could see radio waves emitted by hydrogen atoms thinly scattered in the outer fringes of the visible galaxies–far beyond the last stars in the spiral arms. They expected that if these atoms were far away from the main mass of the galaxy–if each atom were, in effect, a little planet circling the galaxy as the planets circle the Sun–then the farther out an atom was, the slower it would be moving.

Imagine the astonishment, then, when the results from galaxy after galaxy gave the same result–all the hydrogen atoms, like the stars themselves, move with the same velocity, out to the very limits of detectability. There was only one conclusion that could be drawn from that result: those hydrogen atoms, like the stars, must be "down in the soup." Like the twigs on the stream in our analogy, they must be carried along by some unseen material exerting a gravitational force that keeps them from slowing down. This material is "dark matter."

Today, we understand that what we normally think of as the "galaxy"–the pinwheel of stars–is in fact only a part of the entire structure. It is surrounded by, and immersed in, a globe of unseen dark matter that makes up at least 90 percent of its mass. The real story of the Universe, it seems, is in the dark matter.

Right now there is enormous ferment as scientists from many disciplines join forces to explore this strange new terrain. Experimenters and observers want to know how much dark matter there is, where it is and what it is. Theorists want to understand how the existence of dark matter could affect the evolution of the Universe and what role it plays today.

Dark matter may hold the key to one of the ultimate questions we can ask about the Universe: What is its fate going to be? Will the expansion we see going on now continue forever, or will it reverse itself some time in the

James Trefil teaches physics at George Mason University. A new edition of his Dictionary of Cultural Literacy *is about to be published.*

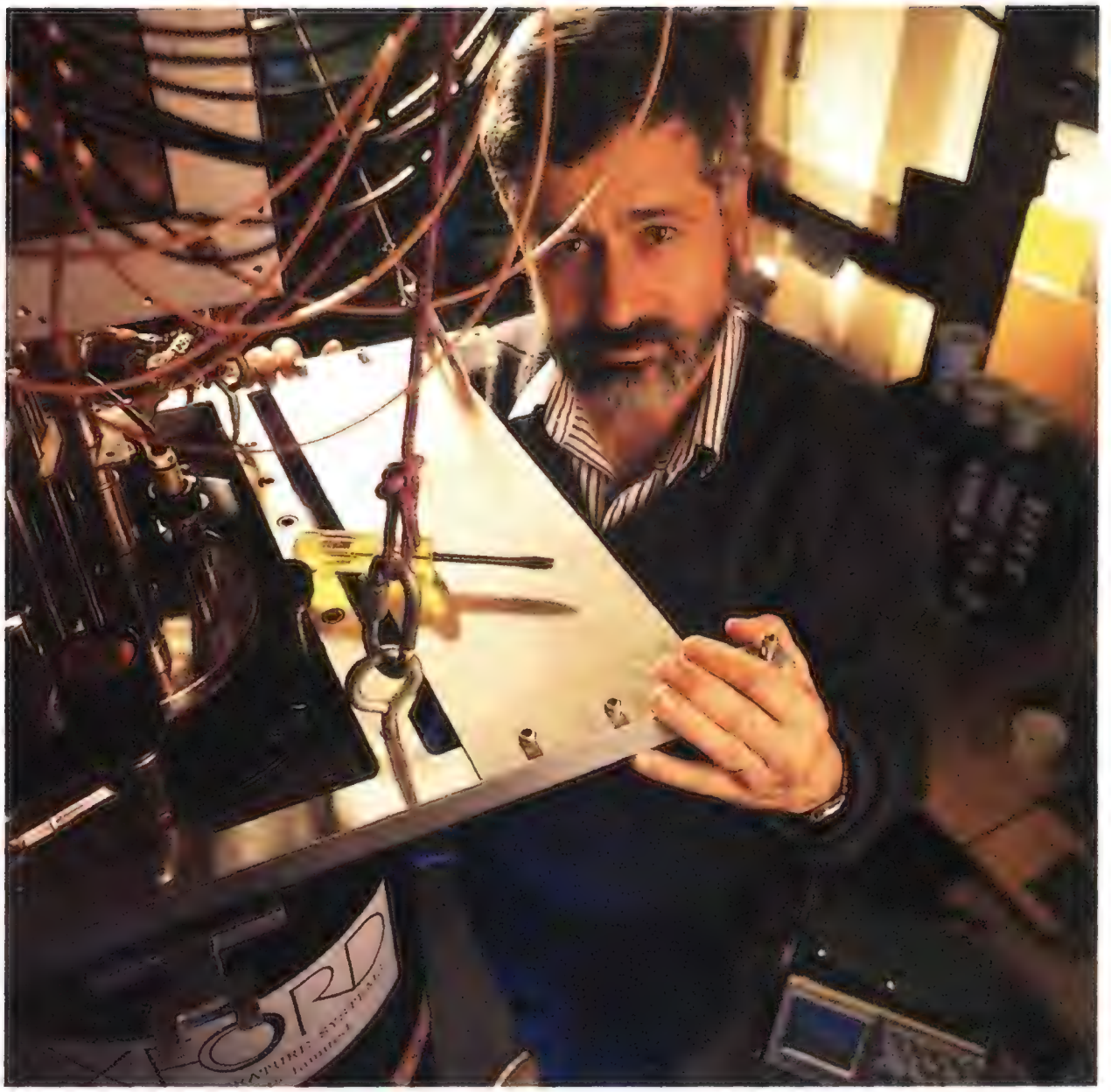
David Schramm at the University of Chicago (above) is a leader among theorists trying to discover if dark matter is made of normal particles or something else we know nothing of. Christopher Stubbs at U.C.

future? The answer depends on how much matter—both luminous and dark—is pulling back on the outward-flying galaxies. Most current theories say that there is just enough mass to stop the expansion and cause the Universe to collapse in on itself again—to "close the Universe" in the jargon of the cosmologists. The amount of matter known to exist is usually expressed as a fraction of this magic number. Luminous matter makes up less than 1 percent of the amount needed for closure. Add in the huge dark matter haloes around galaxies and the stuff known to exist in big clusters, though, and this number climbs to 20 percent or even 30 percent. Theorists say the rest is out there, but where?

One of the cleverest schemes to "weigh" distant collections of stars and their associated dark matter is being carried out by a consortium of scientists led by Anthony Tyson at AT&T Bell Laboratories in Murray Hill, New Jersey. The idea is based on the famous bending-of-light observation that first confirmed Einstein's theory of general relativity. When a beam of light passes near something massive, like the Sun, it is bent by the gravitational pull. Tyson's scheme is to look at the distortion of light from distant galaxies caused by clusters of galaxies closer to Earth. The images of those farther galaxies will be altered as the light coming from them is bent by the gravitational pull of the nearer clusters. Think of Tyson's search as analogous to "detecting" defects in a glass window by measuring how much they distort the images of distant buildings and trees.

When observers look "in back of" nearby clusters, they see the normal spiral shapes of galaxies twisted and distorted into arcs. The degree of distortion of a distant galaxy's image depends on how much mass is bending the light beams. Astronomers find that the amount of distortion is more than what you would get if the only dark matter in the foreground cluster were in the haloes of its galaxies—in other words, there is more dark matter in the Universe than just that found in haloes.

Data confirming the existence of more and more dark matter just seems to keep pouring in. In early 1993, for example, astronomers working with ROSAT, an x-ray observatory in orbit around Earth, announced the dis-



Berkeley (center) looks for stars being eclipsed by blobs of dark, but otherwise ordinary, matter called MACHOS. Bernard Sadoulet, also at Berkeley, hopes to detect exotic particles playfully called WIMPS.

covery of a large cloud of hot, x-ray-emitting gas containing a few small galaxies (p. 33). Again, there was not enough mass in those galaxies to keep the cloud together, but there it was. Astronomers estimated that the total mass in the galaxy-plus-cloud complex could be as much as 30 times what they could see in their telescopes. If this were a universal result, it would imply that there is enough dark matter around to close the Universe.

Or take the "Great Attractor." Scientists have found that the Milky Way and other galaxies in our region of the Universe are streaming toward a region of space that, judging from the speed of the galaxies, must have a mass—and gravitational pull—of 10,000 trillion suns. Right now, astronomers are trying to map out these great rivers of galaxies and, like canoeists figuring out where the rocks are by looking at flowing water, map out where the mass concentrations are. Their results seem to indicate that most of the mass pulling galaxies into these streams is dark matter—the visible galaxies in the direction of the Great Attractor, for example, couldn't begin to pull the Milky Way so strongly. No matter where you look these days, it seems, dark matter keeps popping up.

Most scientists now agree that there is a lot of dark matter around. Indeed, some argue that it makes up a full 99 percent of the Universe. The fun really begins when you start to ask what this stuff could possibly be, because there are all sorts of ideas floating around and precious few bits of information to tie down some of the more imaginative flights of fancy. But essentially the question comes down to this: Is dark matter like us, or isn't it? Is it, in other words, material made up of ordinary atoms like the ones in our own bodies, or is it of something totally new, totally unexpected? In the jargon of the astrophysicist, is dark matter "baryonic"—does it consist of baryons, the heavy particles (protons and neutrons) that make up the nuclei of ordinary atoms?

David Schramm of the University of Chicago has become one of the leading investigators of dark matter. In his office one day, between conversations with his secretary over problems with airline connections to a conference in India, he points out that the Big Bang theory has proved to be remarkably robust over the years, and that

Anthony Tyson of Bell Labs measures dark matter in nearby galaxy clusters by seeing how they distort light coming from more-distant galaxies. At left is how Saturn would look if its image were subject to similar gravitational distortion (here, a black hole causes the Daliesque effect, but the principle is exactly the same).

it definitely has something to say about dark matter. "The haloes of the galaxies could be baryonic," he points out, "but that would use up all the baryons made in the early Universe."

According to current theory, there was a very narrow window in time (about three minutes into the history of the Universe) when matter was packed densely enough for protons and neutrons to come together to make the nuclei of atoms, and the temperature was low enough for the resulting nuclei to survive. Since the total number of baryons doesn't change over time, observations of atoms formed early on (mainly helium and hydrogen) should tell us the total amount of baryonic matter in the Universe, both then and now, a quantity that turns out to be only about 5 percent of what is needed to close the Universe–about enough, in fact, to make up the haloes of galaxies that Schramm was talking about. (It is possible, however, that any baryonic dark matter is not in those haloes but rather in places and in forms that we have never really considered.)

All of this uncertainty and possibility, of course, is one reason why there are so many groups around the world tooling up to conduct dark matter searches. Each search makes assumptions about what dark matter is, then builds an apparatus to detect it. If they find the dark matter, of course, the story ends, but if they don't there are always two possibilities: either the dark matter isn't in the place they looked for it, or it's there but it's not the kind of stuff they thought it was.

For example, one form that baryonic dark matter could take would be smallish lumps of stuff scattered around a galaxy–think of a diffuse swarm of Jupiter-size objects floating around out there. For reasons that will become obvious, cosmologists delight in calling these objects MACHOs (from massive compact halo objects). Since they don't shine, far-off MACHOs wouldn't be visible in an ordinary telescope, but they would temporarily intensify (by bending and focusing) the light of any star they happened to eclipse. To someone watching from Earth, it would appear that the distant star being eclipsed by a MACHO would brighten, then fade back to its normal intensity over a period ranging anywhere from hours to years.

Christopher Stubbs, a young physicist who works at both the University of California at Santa Barbara and the Center for Particle Astrophysics (CfPA) at U.C.

Berkeley, is one of the people leading this particular search. The basic idea is that a telescope at the Mount Stromlo Observatory in Australia is pointed at the Large Magellanic Cloud (a small "suburban" galaxy about 179,000 light-years from Earth), and elaborate electronic detectors record short-term brightening of the stars as they pass behind the posited MACHOs. "It takes us about five minutes to take one picture," says Stubbs, "and we monitor 10 million stars each night. If the galactic halo is made from MACHOs, about one star in five million should have its light focused at any given time. Our goal is to take enough data to say for sure whether the MACHOs are there or not."

This search by astonomers from the CfPA, Mount Stromlo and Lawrence Livermore National Laboratory began in late 1992. It pushes the limit of what can be done both in terms of measurement and data analysis. The detector is a high-tech version of the chip in your camcorder, and the observers monitor two different colors to make sure that what they see is not just a star flaring up. (Focusing by MACHOs would cause both colors to increase in intensity by the same amount; this would not happen if their brightening were because of something happening inside the star itself.) The "firehose of information," to use Stubbs' phrase, that results from these measurements corresponds to having to read three volumes of the *Encyclopedia Britannica* for each picture, then checking to see whether each word matches last night's version. "Even if we don't find MACHOs," Stubbs points out, "this will be the first time anyone has monitored this many stars over a long period. There's bound to be some interesting astronomy in our data."

But what if the dark matter is really something new, as most cosmologists seem to expect? It would be spread loosely around the Universe, and wouldn't be nearly lumpy enough to be seen in the searches for MACHOs.

Trying to catch a mystery particle

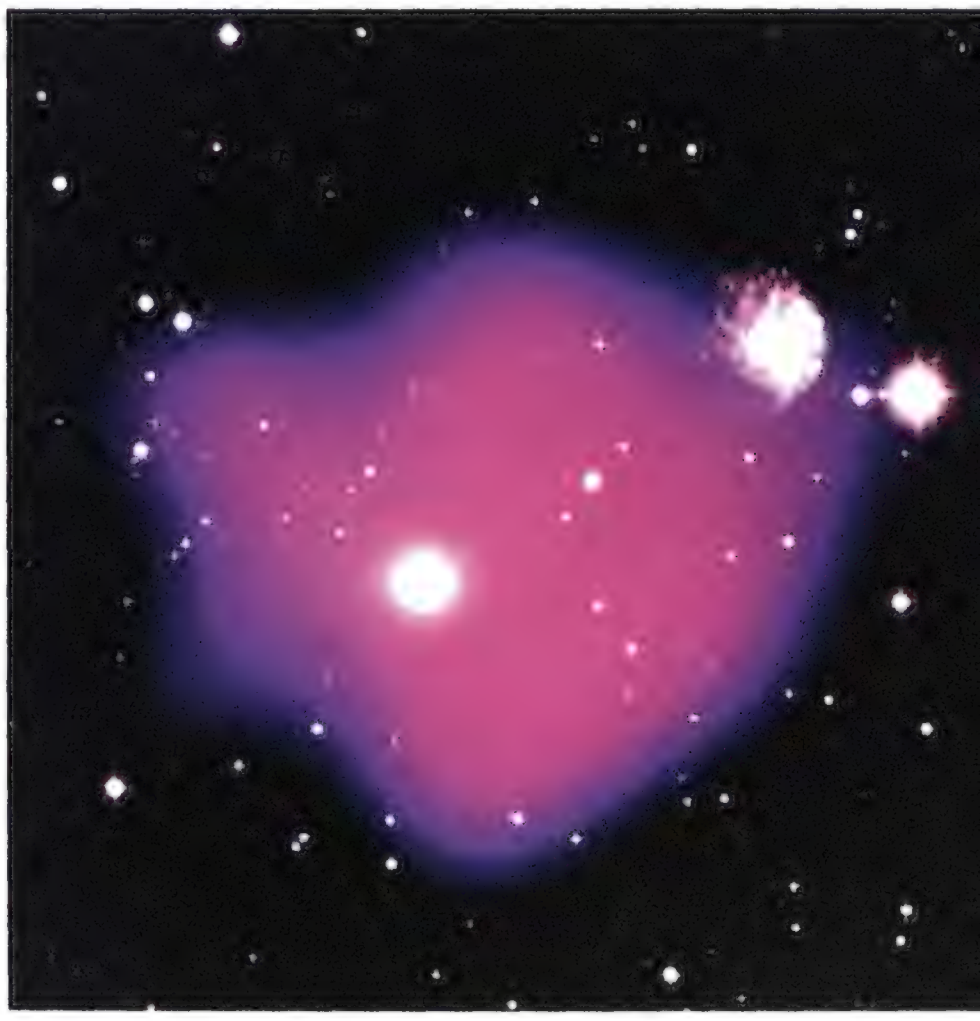
To get some sense of how scientists look at this question, I went to the CfPA, an institution that was set up for the express purpose of using the techniques of physicists to explore the origin and structure of the Universe. There, physicist Bernard Sadoulet, director of the Center, and his group are building the experiment that may well tell us what the Universe is mostly made of.

A pleasant, slender man with a gray-flecked beard and a scholarly manner, Sadoulet takes delight in laying out the logic of his experiment with Gallic precision. In an office whose walls are lined with color photographs of galaxies and whose windows look out on redwoods, he draws a flow chart to illustrate his thoughts.

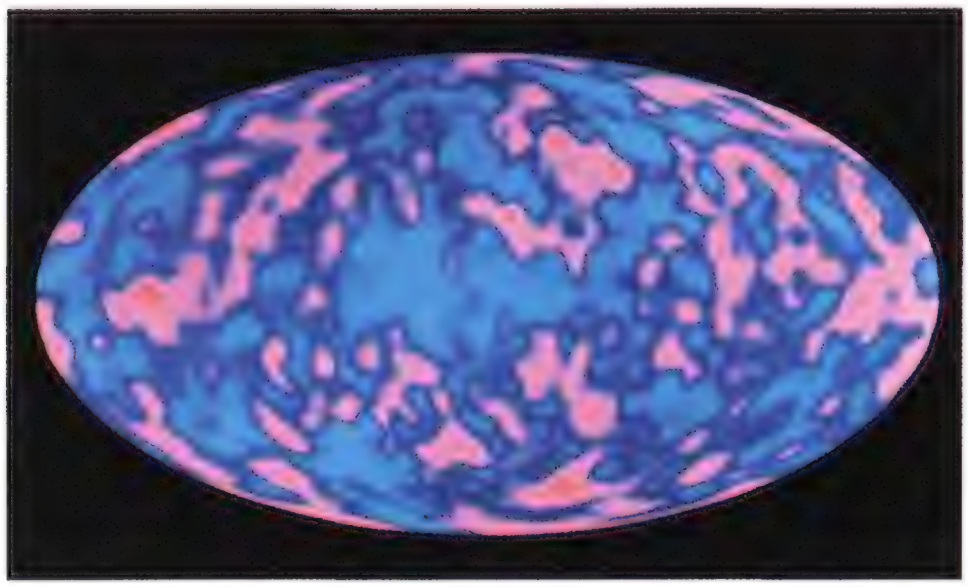
"The Big Bang produced all the particles we know about and all those we don't," he notes. "Some of them are still hanging around. If the amount of dark matter is only 10 to 20 percent of what's needed to close the Universe, it could all be in MACHOs or something similar." He draws a short dead-end to the left on his flow chart. "If there's more," he says, brightening, "it can't be baryons." He then goes off into the zoo of possible elementary particles that theorists think might exist, discussing how each of the strange beasts might be detected. Like most physicists these days, he thinks the best bet is that dark matter is made from a class of objects known as weakly interacting massive particles. Their standard acronym–WIMPS–explains why scientists were so pleased with the term "MACHOs" for the competition.

WIMPS may be many times heavier than the protons and neutrons that normally make up the nuclei of atoms, but they don't interact much with ordinary matter. Millions of them could be passing through your body right now, for example, without disturbing a single one of your atoms. That's good, because if physicists like Bernard Sadoulet are right, millions of WIMPS *are* passing through your body as you read this.

The argument goes like this: the Universe is full of WIMPS–they form a background against which all other objects appear. Earth is moving around the Sun and the Sun is rotating around the galactic center, so Earth is constantly sweeping through the sea of WIMPS. If we could feel them, it would seem that a constant "dark matter



Composite image shows galaxies and huge cloud of hot gas; only dark matter could hold system together.



Satellite image of the early Universe shows clumpy structure that could be caused only by dark matter.

wind" was blowing by. Because dark matter interacts only weakly with ordinary matter, most of the WIMPs pass on through the atmosphere, your body and even the solid Earth without leaving a trace. Occasionally, though, one does interact, and it's the evidence of those elusive encounters that Sadoulet and his group hope to detect.

To do it, a single large crystal of material such as germanium is cooled to within a few thousandths of a degree of absolute zero, so that its atoms are barely moving. Theoretically, on occasion a particle of dark matter will pass through the crystal and interact with one of these atoms, causing its nucleus to recoil. The energy in that recoil eventually will be shared out among the other atoms, raising the temperature of the crystal by a tiny (but measurable) amount. Ordinary particles, such as those in cosmic rays, tend to knock electrons off atoms rather than making the nuclei recoil, so energy is added to the crystal in a different way. WIMPs should leave a clear fingerprint in the crystal.

This winter, the detector will be installed in an underground chamber in the old High Energy Physics Laboratory at Stanford University, across the bay from Berkeley, and the countdown begins.

"We expect to see about one event every ten days or so," says Sadoulet, and he hastens to point out that the main difficulty they will face is picking out the occasional WIMP interaction from among interactions from all the other particles going through their crystal. To give just one example of the kind of problem they face in measuring such small temperature changes, consider this. The stainless steel they use to hold up the low-temperature "icebox" is made by a process that allows small amounts of radioactive cobalt-60 to wind up in the finished product. Some of the particles given off during the decay of the cobalt-60 will necessarily enter the detection crystal, and the experimenters have to be able to tell when this happens. That is why the distinctive fingerprint of the WIMP is so important. In the words of Peter Barnes, a Berkeley graduate student who is working on the experiment, "We're supposed to sit and wait for dark matter to come by, but most of the time something else comes by."

While Sadoulet and his colleagues are watching their instruments, other astronomers and cosmologists are finding more and more ways to make dark matter solve their problems when (and if) it's found. Perhaps the best example of this was the discovery, announced in 1992, of the "ripples near the beginning of time" by the Cosmic Background Explorer satellite (COBE). This discovery (left) points to how dark matter plays a role in solving a problem–some would say *the* problem–in our understanding of the Universe: the question of how the Big Bang led to the clumping of matter into galaxies and the other structures we see when we look out at the sky.

Matter is not spread evenly through the Universe as one might expect. Not only are stars gathered into galaxies, but galaxies are gathered into groups and clusters, and these, in turn, form gigantic structures called superclusters. Our picture of the Universe today is a lot like a pile of soapsuds–the luminous matter (in the form of superclusters) is confined to the soap films, and in between are voids, largely empty of matter. The problem is understanding how matter could have come to be so unevenly distributed.

In an expanding Universe, there are two competing influences. Gravity tends to pull matter together, but at the same time the expansion is spreading the matter farther and farther apart. Whatever clumps of matter survive today are a result of how this competition played itself out in the early Universe. To get the soapsuds Universe we live in, the clumping would have had to have started early, while matter was still close enough together to be pulled into the nascent structures.

First it was too hot, then too late

Until the Universe was about 300,000 years old, however, it was a hot, turbulent plasma–more like the material in a welder's arc than the solid Earth we're on today. If any clumping had started, the intense pressure of the radiation in the plasma would have blown it apart. Only after 300,000 years or so, when the Universe had cooled off to the point that those nuclei could capture electrons (and thus become the atoms we are familiar with) could the gravitational collecting get started. Unfortunately for cosmologists, by then it was too late–not only was matter too thinly spread to form superclusters, clusters and groups, it was too diffuse even to make the kinds of galaxies we see all around us. Something has to be missing from this picture.

That something, of course, could be dark matter. The

most popular scenario among cosmologists these days, one called "cold dark matter," takes advantage of the fact that dark matter doesn't interact with light or other kinds of radiation. The incredibly intense radiation that prevents ordinary matter from forming passes through concentrations of dark matter as if they were ghosts. This means that dark matter could start forming into clumps early on, when things were still close enough together for gravity to hold sway. These aggregations could easily have formed the dark equivalents of galaxies, groups, clusters and superclusters. Then, when atoms were able to form, ordinary matter was attracted to these clumpings like filings to a magnet.

If this scenario comes anywhere close to describing what actually happened, we should be able to see the ordinary matter clumping together soon after the atoms formed. In fact, COBE measures radiation that was emitted about that time. The pattern astronomers see in its images is unequivocal–visible matter in the Universe was highly clustered, even back then. If, as most scientists believe, this clumping was caused by the presence of dark matter, then the "ripples near the beginning of time" tell us that dark matter has determined the way the Universe operates almost from the beginning. Given that it will also determine the end of the Universe, you have to come to the conclusion that ordinary matter–the sort of stuff we're made of–just isn't terrifically important in the grand scheme of things.

Almost every scientist I talked to referred to this discovery as the "ultimate Copernican revolution." Not only is Earth not the center of the Universe, they pointed out, not only is the Sun not the center of the Milky Way, and the Milky Way not the center of the Universe, but visible matter, which we always considered the very fabric of the Universe itself–the stuff we have spent millennia trying to understand–turns out to be something of a cosmic afterthought.

Are they discouraged by all this? If they are, I certainly didn't detect it. Perhaps David Schramm put it best. Leaning back in his chair, looking out his window, he mulls things over for a moment before smiling and delivering his assessment of the philosophical impact of dark matter:

"I guess we're just not made from the Right Stuff."

If the view of the majority of astronomers is right, a wind of dark matter is constantly blowing through us.

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PRIZM

By Phil Patton

'Sell the cookstove if necessary, but come to the Fair'

At the Columbian Exposition in Chicago in 1893, Americans got dazzling glimpses of the future and the gams of 'Little Egypt'

"Sell the cookstove if necessary and come," ran the famous cry that novelist Hamlin Garland included in a letter to his parents, back home on the farm. "You *must* see the Fair."

The fair was the Chicago World's Columbian Exposition of 1893–the White City, as it became universally known. No world's fair before or since has captured the national imagination quite as completely. Not even the Centennial fair of 1876 or the New York World's Fair of 1939 so shaped the way the nation saw itself and the world. The Exposition was one of the epochal events of its time. It is hard for us today to grasp the impact a simple world's fair could have on the nation–an impact combining the appeal of a moon launch and the Bicentennial celebration. In its half-year of existence, it drew 27 million visitors–a number approaching half the American population.

Marking 400 years since Columbus stepped ashore, the Exposition aimed to celebrate much more than an anniversary. In the dreams of its ambitious organizers, the White City would also mark America as a great civilization, the crowning flower of a historical progression as relentless as that of the stately Grecian columns along its Court of Honor.

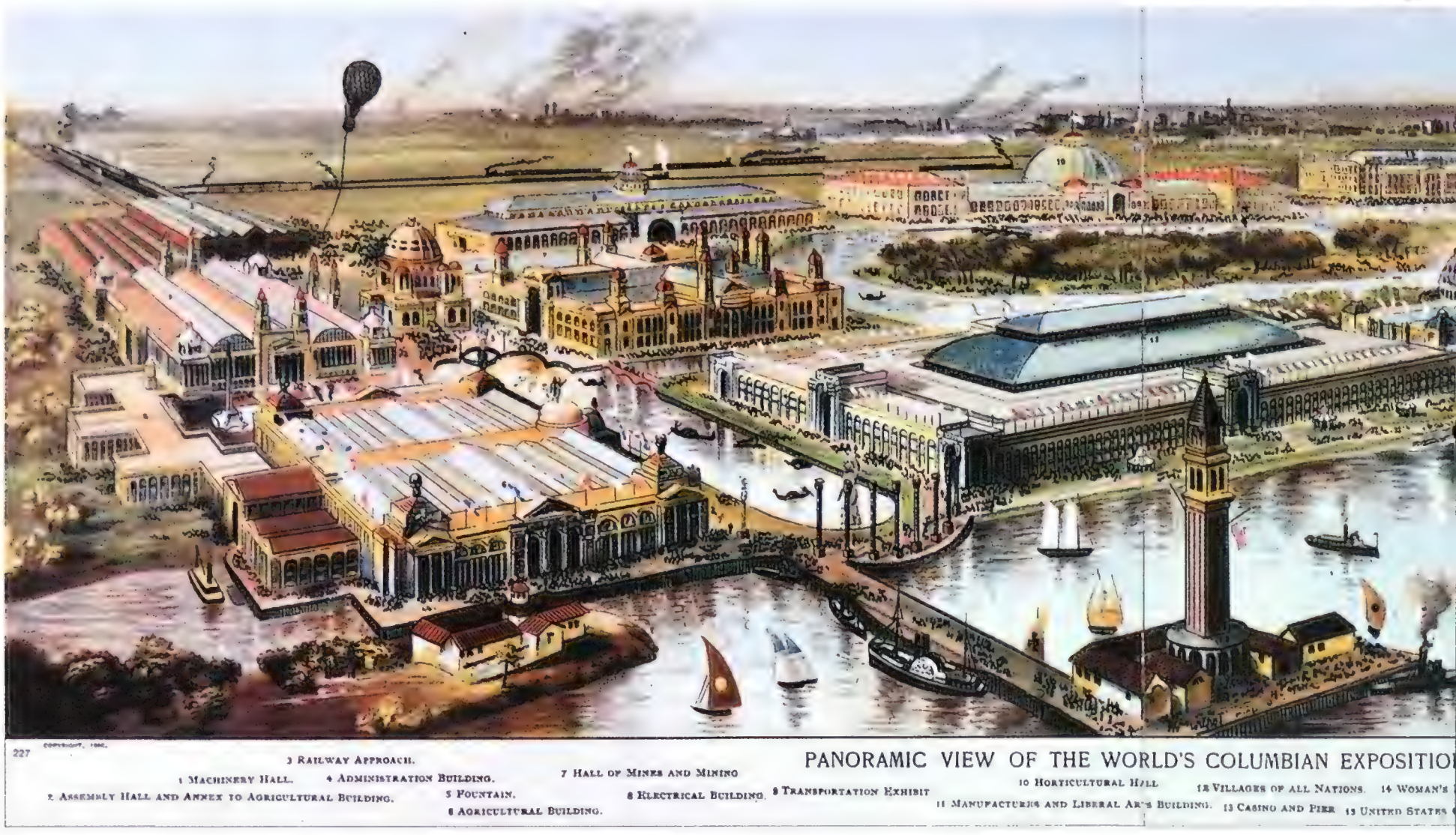
With its shining neoclassical architecture, its stretches of water and great perspectives, the fair carried visitors in imagination across time to the classical era and across space to the grandeurs of Europe and the mysteries of Asia. Moored like an imperial Great White Fleet of buildings in formation around the central Grand Basin, focused on the huge, laurel-wreathed statue that personified the Republic, the fair was a means of mental transportation and conquest. Nothing says more about the power of the White City than that it inspired the Emerald City. Children's writer L. Frank Baum never forgot the fair and transmuted it into Oz, there at the end of the Yellow Brick Road.

But for most visitors, the White City was all the more astonishing for lying at the end of a dirt road or a sooty

View toward Machinery Hall and the Agricultural Building (at the far left) was a festival of bright flags, fancy fountains, florid statuary, domes, columns, towers and neoclassical facades in alabaster white.

railroad. To travel to Chicago and the White City, to put up in one of the wooden hotels that sprang up like mushrooms at the edge of the fair and then pass through the gates, was suddenly to be transported to something resembling the prairie preacher's vision of heaven or the Celestial City in *The Pilgrim's Progress*. To visit the Exposition was to visit not just Chicago but, it seemed, ancient Rome and Greece, as well as the distant reaches of the planet, Java and Dahomey, as sampled in the "anthropological exhibits" of the multifaceted Midway Plaisance.

Many visitors entered through a simple, tall plank fence, like that surrounding an old baseball park. But the most dramatic entrance was probably made by rail from downtown Chicago. These visitors disembarked at the train station that was in back of the domed Administration Building, then emerged into the bright court surrounding the Lagoon, to be struck head-on with the sheer size and extent of the white buildings.



Engraved panorama with 19 numbered sites told where serious exhibits were, as well as providing a sense of the fair's design–done by Frederick Law Olmsted–and location in relation to Chicago and Lake Michigan.

The great bright vistas spoke of the past and the future at once. To stroll around the Grand Basin and through the Court of Honor, with its serious but overblown renditions of Greek and Roman architecture, was to get an impression of sweetness and light, of a spun-sugar classicism. But inside the buildings, one encountered massive machinery (p. 46)–steam engines and electric generators, huge stacks and mounds of agricultural, mineral, and industrial plenty–and wonders from all over the world: art, craft, engineering.

There, the cookstove was electric–as strange in that time of wood and coal as cooking by laser would be in ours. America in 1893 was still largely rural. The average American was a farmer used to horses, kerosene lamps and hand-pumped water. Telephones were rarities, and few believed they would ever become a regular fixture in the home. Electric light was a charming novelty used mainly in public spaces. The phonograph and the automobile were technological toddlers. Still, it was clear that change was coming. In downtown Chicago, typewriters and elevators were helping create the new day of office work in a new kind of building–the skyscraper.

While the whole world was invited to Chicago–there were 48 state and nation exhibits at the fair–the 200 buildings on 633 acres were mostly a kind of encyclopedic, three-dimensional Yankee catalog, something like the great department stores of Chicago itself: Marshall Field's, Sears, Carson Pirie Scott. It was also a kind of tract, an argument for the superiority of our civilization. Fairs, said President Grover Cleveland, are the "timekeepers of progress." The fair measured American progress and found it highly satisfactory, as well as inevitable; it saw itself as American destiny made manifest.

The nationalist chest-beating now seems naive and a bit embarrassing, the condescension unattractive, but the ambition was touching–perhaps even noble. To remember it, in the shadow of the recent 500th anniversary of Columbus' landing, is to sense the difference a century has made.

It was in the neoclassical architecture, grandly constructed from a plaster, cement and jute fiber combination called "staff," as flimsy as a film set, that the Exposition's theme was struck most clearly. Frederick Law Olmsted, designer of Central Park and dean of American park and town planners, was hired to lay out the fair. Chicago architect Daniel H. Burnham was put in charge of hiring the finest architects and sculptors of the day. These included Richard Morris Hunt, who had done the

Out of view to far left were tawdry but thrilling Midway charms of the Ferris Wheel and "A Street in Cairo."

base of the Statue of Liberty, the firm of McKim, Mead & White, George B. Post, Louis Sullivan and William LeBaron Jenney. The list of sculptors was headed by Daniel Chester French, Frederick W. MacMonnies and Augustus Saint-Gaudens. Mary Cassatt painted murals for the Women's Building. "You know," sculptor Saint-Gaudens remarked to Burnham, disdaining false modesty, "this is the greatest meeting of artistic minds since the 15th century!"

The Court of Honor, built along the Grand Basin, itself edged by broad boulevards and linked to a series of canals, offered an excuse for a dramatic Beaux-Arts arrangement of vistas and axes. What was new was not so much the architecture as the size and composition of the whole—it was to be an American Paris. Out of the Basin rose a 65-foot-high gilded female figure of the Republic. Court of Honor buildings, all alabaster white, were by far the largest that most visitors had ever seen (one structure took up 30 acres).

There were a few exceptions to the classical style. The White Star steamship line, for instance, created a sort of nautical folly of a pavilion, with portholes and deck. And Louis Sullivan deviated from the party line for his famous Transportation Building, with its great Golden

Elegant Electricity Building enclosed 265,000 square feet, housed inventions by Edison and Nikola Tesla.

Transportation exhibit with Golden Door, designed by Louis Sullivan, had vast annex full of railroad cars.

Horticultural hall, seen from an island in the Lagoon, was a giant greenhouse with glass dome 113 feet high.

'Sell the cookstove and come to the Fair'

World's first Ferris Wheel cost 50 cents a ride and had soft plush seats that lifted you 264 feet in the air.

At Hagenbeck's Animal Show on Midway Plaisance, people get ready to ride an assortment of animals.

Door ornamented in classic Sullivanesque floral and abstract patterns. The Golden Door was a favorite of fairgoers. Behind it stood a model of Pullman, the ideal workers' town that George Pullman had created south of Chicago, as well as one of the most elaborate private railroad cars ever built, at a cost of $38,000, named the *Santa Maria* and fit for a robber baron.

Behind their Renaissance or classical facades and lobbies, the Beaux-Arts buildings combined the wooden frame technology, which had been used to rebuild Chicago so rapidly after the fire of 1871, with the metal equivalent of a vast railroad shed.

Chicago and the fair shared in mystery, excitement and danger. The city had fought hard for the fair, besting New York and other cities. In the 1890s it was regarded as a wonder in itself, a city of the future, all the more American for being heavily populated by recent immigrants–its population had doubled in the 1880s. It was also a city of 5,000 saloons, an ethnic melange with more than 40 percent of its citizens foreign-born, the center of the nation's railroad system and Carl Sandburg's "City of Big Shoulders." It was, wrote William Dean Howells, "an ultimate Manhattan, the realized ideal of that largeness, loudness and fastness, which New York has persuaded the Americans is metropolitan."

The White City provided an alternative vision, a utopia seen from afar. In promotional material, the view

Present: a muzzled bear, goose, ponies, zebra, ride-on baby elephants, an adult elephant and two camels.

Terpsichorean charms of "Little Egypt" helped put the word "hootchy-kootchy" into the American language.

was always from a distance–from the eye of the eagle or, in one often reprinted photograph, of a woman with a parasol atop the giant Manufactures and Liberal Arts Building. A man named William Prettyman was hired as director of decoration, then replaced by painter Francis D. Millet, whose task it was to paint everything white. One of his engineers invented a pressurized sprayer to get the job done in the limited time allotted. A ban on the burning of coal on the grounds kept the White City white, in contrast to the sooty gray city to the north. The Exposition was a kind of stage set, and photography was strictly regulated–even for amateurs, who had to pay $2 just to bring a camera onto the grounds.

The White City was whitest at night, when necklaces of lights outlining the buildings, and the floodlights on facades and fountains–an unprecedented display of electric candlepower–set it against blackness. Howells described the night view from one of the gondolas that shared the water of the Grand Basin and its connecting canals with electric launches: "In the splendor of the hundred moony arc-lamps of the esplanades and the myriad incandescent bubbles that bead the white quays," Howells wrote, "I found myself in the midst of the Court of Honor. . .for the moment I could not believe that so foul a thing as money could have been even the means of its creation."

But money *was* the means, and if the outside projected classical unity above crass concerns, inside the great plaster temples lurked the soul of a corn palace. A strange commercial surrealism prevailed. Behind the white columns the crowds found giant barns, steam threshers, buildings made of ears of corn, pyramids of giant pumpkins, piles of grain and stacks of lumber. The fair seemed inadvertently fantastical, as shown by its very first postcards of giant apples on flatbed railroad cars, of jackalopes and furbearing trout–a surrealism of the American heartland, the unintentional result of sheer enthusiasm.

Pyramids and temples of fruit and metal ingots and logs provided a kind of architectural equivalent of the artist Archimboldo's vegetable portraits. In the Horticultural Building there was a Liberty Bell made of oranges, and in the California Building, a life-size knight made of prunes. In the Electricity Building, the Western Electric Company displayed its switches and sockets in an Egyptian temple, while one state offered a Greek temple with columns made of grain-filled glass jars.

Above all, the fair was the dry run for the mass marketing, packaging and advertising of the 20th century. Newly introduced American Express rail and hotel packages, advertised in bright lithographs of high-pitched

Writer Phil Patton's recent book, Made in USA: The Secret Histories of the Things that Made America, *will be published in paperback by Penguin in July.*

reds and blues, marked the beginnings of modern tourist travel. Around the fair's perimeter ran an elevated electric train called the Intramural–the first in a family of sleeker monorail trains that no future world's fair would be without. Inside the grand buildings the visitor found a foretaste of 20th-century technological and commercial America. New products were introduced and new brands became famous. The fair introduced the first fiberglass, the first American souvenir postcards, the first zipper, the first demonstration of long-distance telephone service from Chicago to New York City. It foreshadowed mass consumption, made possible by national brands and by giving names and identities to things that had previously been generic substances. Also introduced were: Chase & Sanborn, the official coffee of the Exposition; Baker's Chocolate, Quaker Oats, Cream of Wheat and Aunt Jemima in person. Pabst Beer got a blue ribbon at the fair. The illusion of fruitful progress and harmony stood in contrast to change and conflict outside. A few days after the fair opened, the stock market crashed and 1893 became a depression year. The fair took place in the shadow of the 1886 Haymarket labor riot and the 1892 Homestead strike, which saw the wealthy shaken by fears of worker unrest and the specter of anarchist attacks.

The first American automobile rolled out of the shop of the Duryea brothers in 1893, and at the Exposition's lecture series–"World Congresses" of experts–Frederick Jackson Turner formally asserted that the frontier, which had defined American character, was now closing. His thesis was given credence by the fact that Buffalo Bill was performing his Wild West Show near the fairgrounds: the frontier had become entertainment. While the fair ran, the Dalton Gang was finally captured, and the former Indian territories of Oklahoma were opened to settlers.

Miles of fancy scrollwork needed for exterior facades were molded well in advance by a cadre of artisans.

Alongside the neoclassical architecture, and the "city beautiful" movement that it inspired, stood the Midway Plaisance, a motley set of entertainments encamped like Huns before Rome, the ancestor of Coney Island and even Disneyland. Chicago's was the first fair to have an official commercial and entertainment section apart from the educational one.

Even Henry Adams rode the Ferris Wheel

It was Henry Adams who best understood the importance of the fair. It offered, he wrote, "matter of study to fill a hundred years." A leading historian and scion of one of America's prominent families, he rode the Ferris Wheel (SMITHSONIAN, July 1983) high above the milling crowds of the Midway Plaisance and delighted in the spectacle. Below him were ranged a strange collection of buildings housing Hagenbeck's Animal Show, "A Street in Cairo," "A Taste of Java," an assemblage of domes, obelisks and minarets. In the distance shimmered the pediments and domes of the White City.

In *The Education of Henry Adams*, Adams had attempted to unify history with metaphorical reflection on modern energy, the Dynamo, and the power of medieval faith, the Virgin Mary. One can imagine him pondering the Exposition atop the Ferris Wheel, which carried some 2,000 passengers in cars as large as small streetcars and towered 264 feet above the ground. Two 1,000-horsepower steam engines drove the wheel's steady and silent rotation around a 45-foot axle–the largest single piece of steel ever forged, visitors were told. For Adams, this was about as close as possible to getting inside a dynamo. He wondered if the fair's art was not all "a stage decoration; a diamond shirt-stud, a paper collar." Yet, seen as a whole, he decided, "Chicago was the first expression of American thought as a unity."

The closest thing to Adams' idealized Virgin were the ubiquitous statues of Columbia–figures of fuzzy iconography, variously representing Liberty, the Republic, Electricity and, indirectly, the high Victorian ideal of Womanhood. Part goddess of liberty, part huntress Diana, part Persephone, goddess of the harvest, she was quite adaptable. At the Anheuser-Busch display, for instance, she was clad in a vaguely Wagnerian mailed corset, a nod to the Germanic background of the product and its consumers.

There were plenty of dynamos. Westinghouse had edged out General Electric for the contract to light the White City, winning a key victory for modern alternating electric current in its battle with Edison's direct current.

TASTE IT ALL
Here's to those who make something out of nothing.
Caffeine Free
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Beneath the high steel arches of Machinery Hall, the industrial nations of the world showed off their heavy equipment, mainly big power belts, generators, turbines. Most machines were powered by steam.

The personification of alternating current was inventor Nikola Tesla (SMITHSONIAN, June 1986), who stood with 200,000 volts coursing harmlessly through his body at the Westinghouse exhibition in the Electricity Building. Both companies sponsored elaborate decorative light shows. Such projects, along with the Ferris Wheel nearby, put a new spin on the dynamo: they linked engineering to entertainment in a pattern that foreshadowed the cinema and the amusement park.

In the Midway Plaisance, the displays from "folkloric" peoples—the half-timbered German and Irish buildings—were closest to the White City, with "less civilized" ones seemingly more and more distant, until visitors finally reached the "primitive." There, the Dahomey exhibit sported a sign denying that its inhabitants were cannibals. From the Midway, pageantlike processions including camels and rickshas would set out through the White City, like emissaries of subject powers sent to Rome. Admission was charged at each individual display, in contrast to the White City, where visitors were obliged to shell out only 50 cents to get in.

In keeping with the organizers' passion for classification, the sideshows of the Midway Plaisance were categorized without irony as "ethnology" and, in keeping with their emphasis on education, placed under the charge of Frederic W. Putnam, a Harvard anthropology professor. No doubt baffled to have sword swallowers and belly dancers under his tutelage, Putnam must have breathed a sigh of relief when he came upon a 27-year-old impresario named Sol Bloom, the son of Polish immigrants, who had seen the recent Paris fair. Bloom's résumé makes him sound like the very prototype of the film tycoons, a Sam Goldwyn or Louis B. Mayer, and he would eventually become a flamboyant U.S. Representative from New York. But in the Midway, Bloom saw something his more academic colleagues did not: that there was both real skill and art in "primitive" crafts and ceremonies.

"I came to realize," he wrote, "that a tall, skinny chap from Arabia with a talent for swallowing swords expressed a culture which to me was on a higher plane than the one demonstrated by a group of earnest Swiss peasants who passed their day making cheese and milk chocolate." In this he was forward-looking, as he also was in his understanding that "ethnology," in varying degrees of authenticity, could be sold as entertainment.

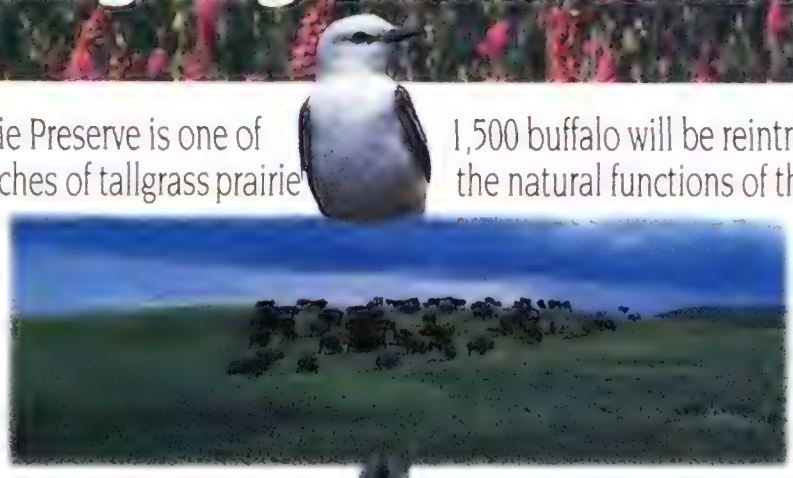
The belly-dancing rhythm of the hootchy-kootchy, the *danse du ventre* and the caricatured melody of the Casbah are familiar to cartoon watchers. "Little Egypt," the most famous of the Midway dancers, represented the epitome in 1893 daring. The beauties of the Midway, including those of the World Congress of Beauties ("Forty Countries, Forty Beauties"), all more fully garbed than advertising might have led male patrons to hope, contrasted with the classical females of the White City.

The arrangement of the Midway exhibits and the treatment of those on exhibit bespoke a racism that extended to the aptly named White City. Excluded from even the most menial of jobs building and maintaining the fair,

How we see it.

How our great grandchildren will see it.

The Tallgrass Prairie Preserve is one of the last great stretches of tallgrass prairie remaining in North America. More than a hundred years ago, great herds of buffalo roamed these vast acres of grassy prairielands. And thanks to The Nature Conservancy they will again soon. Working with neighbors and volunteers, The Conservancy has undertaken an unprecedented effort to recreate the living prairie. Today towering bluestem grass, waves of prairie wild flowers and much of the original wildlife including rare Swainson's hawks, golden eagles, greater prairie chickens, deer and bobcats are thriving there. In just a few years, 1,500 buffalo will be reintroduced to play their part once again in the natural functions of the prairie. So that we, our children and our children's children can enjoy this vast tallgrass ecosystem as nature intended. For more than 40 years, The Nature Conservancy has without much fanfare been responsible for saving and restoring over 6.3 million acres of America's precious natural areas so that both people and nature can flourish on them. At the Miller Brewing Company, we are very proud to be a supporter of their ongoing efforts by committing our time, our talents and over $1,000,000 of our resources. Like The Nature Conservancy, we believe the quality of life for future generations depends on our commitment to preserving these gifts of nature now.



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To learn more about The Nature Conservancy as well as what Miller is doing to support their efforts call 1(800)628-6860

Collection of Dr. Stephen Sheppard

Watercolor lithograph depicts the classical expanse of the Grand Basin and surrounding buildings. With fountains, gondolas and broad, imposing facades, fair managed to seem like Venice and Versailles combined.

African-Americans were provided eating and restroom facilities only in the Haiti Building. Frederick Douglass called the White City "a whited sepulchre" and produced, with Ida Wells, a pamphlet titled "The Reason Why the Colored American is Not in the World's Columbian Exposition." That reason was simple racism–an essential part of an approach that categorized countries on a pyramid, with "progress" embodied, naturally, in American civilization at the top. This attitude extended overseas. The Japanese Ho-o-den temple met with approval but also condescension. Artisans arrived from Japan to erect the building with what one guidebook called "their little pile driver."

Women, too, were exiled to their own building, designed by Sophia G. Hayden. It took strenuous protests by wives of the leading powers behind the fair and by Susan B. Anthony, the feminist leader, to achieve even that segregated measure of participation.

If Frederick Jackson Turner's speech at the Exposition echoed a Census Bureau report declaring the frontier closed–and with it the frontier experience of "continually beginning over again"–there were other signs on the Midway, in such exhibits as a Sioux chief's cabin, in front of which the Sioux chief was persuaded to pose. Buffalo Bill had long found it more lucrative to stage mock shootings of bison than real ones. Now, he decided to broaden the appeal of his show. Operating just outside the walls of the Exposition, he added daredevil bareback riders from Asia to his show, and the phrase "and Congress of Roughriders of the World" to his show bills.

The end of the frontier sent many in search of its replacement in technology, culture or empire. Just as the West was won, early imperialist efforts aimed at extending the frontier to the Philippines and Cuba–a process that would shatter the air of friendship with Spain celebrated at the fair. Hawaii was declared under U.S. protection in 1893; five years later, Theodore Roosevelt would adopt the name "Roughriders" for his famed unit of cavalrymen.

The fair ended on an ominous note when Chicago mayor Carter Harrison was shot to death the day after Chicago Day, October 9, 1893, which had marked the largest attendance of any single day. The assassination by a deranged malcontent seemed to foreshadow the coming era of violence and social turmoil. In January 1894, fire destroyed many of the buildings–a fire to be echoed that summer by fire and conflict at the town of Pullman. In the face of the depression, George Pullman had reduced wages by a third while keeping rents unchanged. His utopian town–a corporate White City–became the

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In the fall, a gaudy poster touted the special carnival to be held 22 years after date of the Great Chicago Fire.

scene of a bitter struggle between workers and employers; federal troops were sent in to suppress the strike.

The images of the fair that survive are static: it was the last fair before the motion picture camera. Today it seems like a great Hollywood film set awaiting its Cecil B. DeMille–and like a world frozen just before change. Edison's Kinetoscope made its first appearance in 1893, but his protomovies had yet to be turned into newsreels. Elsewhere, Edweard Muybridge showed his famous images of horses and men caught in midstride. It remains for us, too, a silent spectacle–the only sounds that survive are wax cylinder recordings of gamelan music played by the Javanese.

This immobility was appropriate for the vistas of the White City, appropriate to the ideal of unchanging values its classicism projected. Only the Ferris Wheel, rolling through the sky, seemed to mock that stability. The world was about to change dramatically. Movement, speed, social upheaval were in the offing.

What is striking, too, is how little material evidence survived the fair. On the grounds, only the Fine Arts Building survived (100 artworks displayed in it may be seen at the Smithsonian's National Museum of American Art and National Portrait Gallery through August 15); it was rebuilt in more durable materials to become the Museum of Science and Industry. A Chicago amusement park took the name "White City." Driving through Jackson Park today, you see a man fixing a car in a parking lot where white columns once stood. Faceless public housing has replaced the cheap hotels around the periphery of the grounds. Along the former Midway Plaisance, a part of southside Chicago called "the Midway," University of Chicago students and children play soccer by a bus shelter scrawled with graffiti. In a circle in the park–the former site of the domed Administration Building–stands a reduced-size model of the statue of the Republic that served as focal point for the Lagoon.

But the architectural ideals of the White City are alive in cities all over the country, one of the finest examples being Union Station in Washington, D.C. "The damage wrought by the World's Fair will last for half a century from its date if not longer," Louis Sullivan wrote. "It has penetrated deep into the constitution of the American mind, effecting there lesions significant of dementia." But that was 30 years later, when Sullivan's career had faded. The simple story of modernism battling the dragon of eclecticism was a gross oversimplification. Even at the same time the Beaux-Arts fair was built, the modern skyscraper was being born in downtown Chicago, offering wide expanses of glass, the reduction of ornament and the expression of the steel frame in the facade of the building. In the wake of postmodernism–with its welcoming of tradition, its affection for quoting older buildings, its respect for larger city planning, even its sense of theatricality–the White City stands higher today in architectural estimation than it has for half a century. One testimony to this fact is the big new public library in downtown Chicago, designed by Thomas Beeby, with such classical features as pediment, ornamental sculpture and "acroteria," draped garlands carved in stone.

When Henry Adams wrote, "Chicago asked in 1893 for the first time the question whether the American people knew where they were driving," he had no answer. Nor do we. But a look back at the Exposition from the perspective of a century provides glimpses of a strangely familiar world. For all its evocations of the ancient and the distant, 1893 sketched out the beginnings of much of our contemporary world.

Exposition memorabilia, owned by collector Stephen Sheppard, includes a kerosene lamp with Columbus portrait, egg timer, pictures of the Ferris Wheel, gilded Tiffany vase and a souvenir spoon now worth $3,500.

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By Richard Wolkomir

An architect who takes stairways one step at a time

Georgia Tech's John Templer believes that stairs reveal history and display artistry–and they'll get you if you don't watch out

Ever since John Templer saw his sister-in-law fall down a flight of stairs at New York City's Lincoln Center, he has been seeking the perfect staircase. "Stairs are one of the most dangerous manufactured objects," he tells me with genuine concern.

But stairs can offer stunning flights of architectural fancy, too. And they are part of our collective consciousness. In Genesis, Jacob dreamed he saw angels going up and down a ladder to heaven. That is in our memory bank, along with Rhett Butler sweeping Scarlett O'Hara off her feet and carrying her up the stairs of their Atlanta mansion. Bedimpled Shirley Temple tap-danced down another celluloid staircase. And Hollywood also gave us two generations of tights-clad Fairbankses, swinging swords on the stairs of make-believe castles. In Victorian England, "upstairs" and "downstairs" were social directions. And jumbled in our memories with stairway nursery rhymes and nonsense–like "As I was going up the stair/ I met a man who wasn't there" and the '70s pop hit "Stairway to Heaven"–are tragedies, such as fabric designer Laura Ashley's fall to her death on a stairway.

Nobody knows more about stairs than John Templer, an architect at the Georgia Institute of Technology. He has pondered stairs for 23 years. And he is the author of *The Staircase*, a recently published two-volume tome from MIT Press on the design and history of the staircase, which he traces back to its invention by the prehistoric human foot. Neolithic people climbed steep slopes by bracing their feet against roots and rocks. Eventually, these footholds were worn into permanent steps. Such "land stairs" still exist in the stepped streets of old Italian towns, and are used by people and donkeys. At New

Templer perches on steps in Atlanta's Healey Building; curved staircases are safer than straight ones, he says.

Rome's celebrated Spanish Steps are a venue for urban drama, attracting throngs of tourists and vendors.

Ruin near Cassino, Italy, offers example of modified "land stairs"; footpath follows contour of hillside.

Towering, narrow–and daunting to tourists–pyramid steps at Chichén Itzá were a Maya pathway to the gods.

Mexico's Sky City, the Pueblo Indians carved steps down a steep rock face to a pool that supplied water.

Some Stone Age Einstein took the stair a step further by cutting down a tree trunk, notching footholds into its sides and leaning it against a wall to be climbed. Templer says West Africa's Dogon people still use such climbing poles, and so do Panamanian villagers. The USS *Constitution*, moored in Boston Harbor, has a climbing pole to reach its bowsprit.

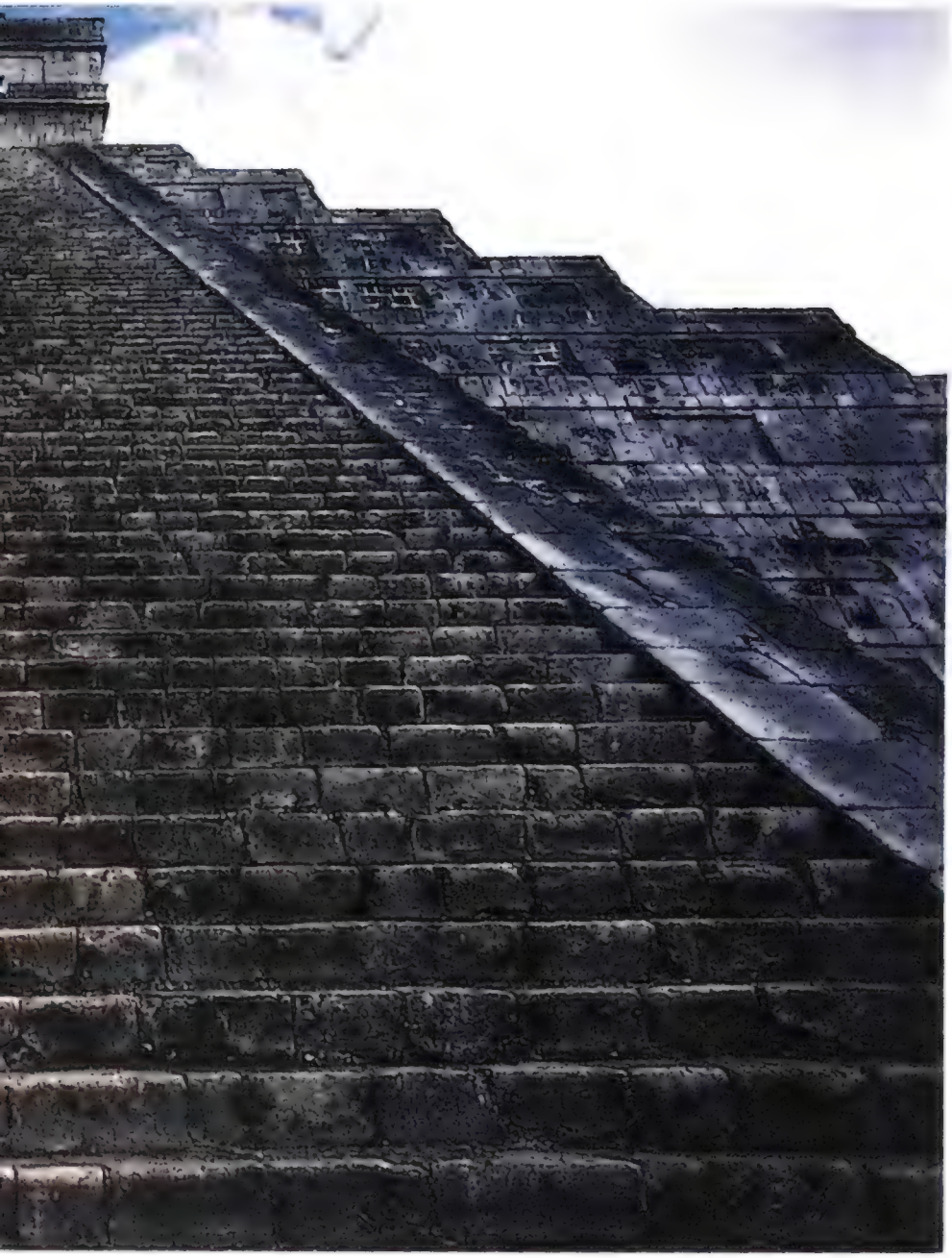
Climbing poles evolved into "straight-flight" staircases, which go up in an undeviating flow of steps. Later came the helical stair, a springlike spiral. Later still, designers invented the composite stair, in which straight or helical flights end at landings, with new flights angling off in different directions.

Stairs are utilitarian, for getting up or down. But they can be striking, too. Among Templer's favorites are the Spanish Steps, built in Rome in the late 1600s and early 1700s. "They flow down the hill like a waterfall, with all sorts of rivulets and ripples and changes of direction," he says. And the landings are as significant as the steps: "They are places for the street vendors, fashion models and photographers; for people to meet, to embrace, to play and to look."

Templer calls stairs "architectural theater." But beauty can be treacherous. In fact, it was a fall, although not his own, that first got him fired up over stairs. When he was a graduate student at Columbia University in Manhattan, a worried citizen telephoned the architecture school with a question: Why did so many people leaving the Metropolitan Opera House at Lincoln Center fall down the front steps? Nobody knew. Templer looked for clues in the university's architectural library. Little, he found, had been written about stairs or stair safety. "All that night the idea of stairs ran through my mind," says Templer, who is a tall man, with a swirl of white hair and a British accent.

Eventually, he did figure out what was wrong at the Met: "People would come out, sodden from hours of Wagner, walk across the plaza jammed with pretzel and popcorn vendors and theatergoers, and never see the stairs because they're so shallow and wide–down they'd go." He took his wife, an artist, on a field trip to the Met, along with her sister. His sister-in-law missed a step and fell.

"I decided this would be a great subject for a doctoral thesis," says Templer. He went on to explore his stairs topic, earned his PhD in architecture and soon learned how apt his choice had been. In a call to his adviser at Co-



Stepped ramp, flanked by ornate balustrade, conducts sightseers into main entrance of Vatican Museum.

lumbia he learned that the distinguished architect had just fallen down a flight of subway stairs and broken his leg.

Templer took up the quest for the perfect stairway with renewed dedication. "There are so many bad stairs–they vastly overwhelm the good stairs." In fact, stairway falls are epidemic. In the United States alone, at least 4,000 people die every year from injuries suffered in stair falls. Another two million Americans are hurt badly enough in stairway falls to require a physician or at least one day's recuperation. "Perhaps stairs should carry a message from the Surgeon General, warning that they may be dangerous to health," says Templer.

He has put his decades of research to work in his own Atlanta home, which he designed: the central stairway–a stunning half-circular upward curl–emulates an automobile's padded dashboard. The handrail is softened with foam, covered with leather. "It's like the steering wheel on a good car–you get a strong grip, and if you fall it won't hurt you," he explains. The carpeted treads are padded with foam, too. Also, the treads are alternately colored dark and light, so that each step's edge is clear. And the proportions are optimal, direct from the lab: risers 7 inches high, treads 11 inches deep. All edges are rounded. Even the stairway's graceful curl makes it safer.

"It used to be assumed that circular stairs were automatically more dangerous, but statistics show they're actually safer," Templer says. "That's because they're a little more difficult to walk on, so you're more cautious, and you also can't fall so far."

One reason for the slip-and-fall epidemic is that today's stair proportions date back to 1675, when the director of France's Royal Academy of Architecture, François Blondel, concocted a formula linking stair geometry to the human gait: 2 x riser + tread = 24 inches (25.5 in today's inches). One of the formula's drawbacks is that, for unusually high or low risers, it requires treads that are extremely narrow or extremely wide.

"Walking on a stair requires skill, like playing with a bat and a ball," says Templer. "If eye-brain-arm coordination is always perfect, we can slug the ball solidly every time, but we're imperfect and sometimes we fail." One reason for pratfalls is that our descending and ascending gaits differ. Going down, shorter risers and deeper treads would be better because descent requires a mo-

When the author travels, he occasionally runs up and down hotel stairs as substitute for a daily six-mile jog; he reports he has never lost his footing.

ment when the body is balanced on one leg, the foot up on its toes, as the other foot reaches down for the tread below. It is an awkward–even dangerous–moment. Our bodies can be ungainly contraptions. And if a high riser forces the forward foot too far down, we can lose our balance and easily topple. As Dante noted in *The Divine Comedy*, the worst thing about hell is that all the steps have different dimensions.

Finding the perfect stairway, esthetically and functionally, is for Templer "a kind of designer's philosopher's stone." One elusive goal is a slip-proof stair. Building codes generally call for nonslip or nonskid surfaces, but that is not specified in detail. Meanwhile, society has no standards at all for the slipperiness of shoe soles and heels. And when rain or spilled drinks wet a stair tread, the surface friction instantly changes.

Slipperiness is not the only problem with which stair researchers are wrestling. For instance, John Templer's studies have shown how our gait on a stairway is influenced by the riser-tread geometry. Ascending, risers from 6.3 to 8.9 inches cause fewer missteps. Lower risers mean the stair has more risers and so more opportunities for tripping. But descending is safer with risers that are only 4.6 to 7.2 inches high. Templer suggests a compromise: risers about 7 inches high.

Tread depth is important, too. The narrower the tread the more we twist our feet sideways as we descend, so that more of the sole will rest on the tread, giving us a more secure base. Meanwhile, average foot length has increased since Blondel's time in the 17th century. Templer calculates that a tread should be no less than 11 inches deep to accommodate the modern foot, while many building codes call for 10 inches or less.

Stairs must also provide space for the body, including room to bob and weave as we ascend or descend. And so designers must consider traffic flow in figuring a stairway's width. When we use a stair we require an ellipse of surrounding space, widest at our shoulders. The minimum width of a two-lane stairway should be 56 inches, while 69 inches would be more comfortable.

Illumination is important, too–one study showed that 95 percent of household stairways are too dim. And there are handrail questions, such as where they should be placed. One laboratory set up trick stairs with steps that unexpectedly collapsed, forcing hapless volunteers to grasp wildly for a handrail to keep from tumbling. After 830 science-induced trips and falls, researchers concluded that the ideal railing height is around 35.6 inches.

John Templer has probed how we use stairways by studying, Sherlock Holmes-style, the paths our shoes erode into steps over centuries. It is, he says, like following the "spoor of animals." He has observed these human trails in stone steps up the side of a medieval building in Orvieto, Italy, and in Manhattan subway entrances. He found a stone stairway slanting down a waterfront embankment in St. Augustine, Florida, that is so narrow, thousands of walkers have had to put their feet in the same spots, creating shoe-shaped hollows in the steps.

Templer's home staircase highlights safety features: precisely proportioned treads and risers, padded rail.

Flailing, then tumbling like a human Slinky

When starting up or down a stairway, Templer has found, we first give it a "conceptual scan," to check out its configuration and any dangers, such as junior's roller skates. Once we have established a "cognitive model" of the stairway, we are ready to start, on the assumption that we know what to expect. Sometimes we assume wrongly–stairs may be irregular–and that can trip us up. To ward off such surprises, we give the stairway a "monitoring scan" every seven steps or so. But distractions can throw us–a view that suddenly opens up or too many martinis. Sometimes we don't see a stairway ahead and experience "unintentional use of steps." Down we go.

Once we start tumbling, it's almost too late. By 190 milliseconds into the fall, we have already dropped seven inches. We are flailing, about to become a human Slinky. Every 2,222 times we use a stair, we have a note-

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Hollywood often capitalizes on stairs to create dramatic effects. In *Sunset Boulevard*, Gloria Swanson, a murder suspect, descends to the police and press. Shirley Temple and Bill Robinson do fancy dance in *The Little Colonel*.

worthy misstep. Women fall more frequently than men, but boys under the age of 14 fall more often than girls of the same age. And you are more likely to take a tumble if you are single. Go figure.

Stairs, Templer says, "remain some of the most dangerous artifacts in our environment." One reason is that building safety has no official watchdog. "We have relatively safe cars, roads and airplanes because of the Department of Transportation, but no equivalent federal agency considers research in building safety as their primary game." Also, building codes used in various regions of the country cling to the ancient riser-tread standards, usually a riser of about 8.5 inches and a tread that is 9.5 inches deep.

A few years ago, based on Templer's and others' research, one of the codes that govern construction in the Northeast was revised to the safer 7-inch riser and 11-inch-deep tread. But the National Association of Home Builders got the change reversed. "They argued that there was no proof the 7-11 standard was safer and that it greatly increased the cost of housing," says Templer sadly, adding that he figures the new stair standard would add only 12 square feet to a house's size.

Research shows that many of the great stairs of history are dangerous. Still, as architectural creations, they can be impressive, with reverberations in our unconscious. Templer traces his fascination with stairs to an old house in the English countryside, where he lived as a child. He was born in 1928 in Oxford, but until age 3 he was raised in Kenya, where his father, a British civil servant, was chief forester. Then his parents sent their children back to England for schooling. Templer lived with his grandmother and his grandfather, an Anglican priest at an ancient Norman church. He grew up in the rambling Georgian rectory, with input for the future architect's data banks: a grand stairway and also a back stairway to the attic, where the servants lived.

After World War II, Templer's family relocated to South Africa, and he enrolled at the University of Natal as an engineering student. He found himself wandering the city, idly studying buildings. It dawned on him that he should switch to architecture. After earning an undergraduate degree, he went on to graduate studies at Columbia, where he became smitten with stairs.

His first interest was safety. But he quickly became fascinated with the esthetics of stairs and their history. He discovered that, early in their evolution, stairs and their kid brother, the ladder, were serious weapons of war. In Egyptian writing, the image of a ladder meant "siege." Pueblo Indians pulled up the ladders to their cliffside villages to keep out enemies. At Mesa Verde, in Colorado, the villagers carved a permanent stair into the cliff face with an ingenious twist: unless you knew the correct foot and hand with which to start your climb, you finished hanging in space, unable to enter the village because the hand you had free to reach up for the final grip was on the wrong side of your body. In medieval European castles, to reach the first floor you often had to climb a stairway that could easily be destroyed to keep out attackers. Or the entrance stairway was positioned so that defenders on the walls could pepper it with rocks or pour boiling oil down onto it.

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Cape Town at night, with Table Mountain rising in the background to a height of 3 567 ft.

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Outside Paris at the magnificent Chateau Vaux-le-Vicomte, the stairway treads deepen gradually as they descend. The aim, says Templer, is to force guests into an increasingly stately gait as they enter the garden.

Stairs had peaceful uses, of course. Designers learned to adjust stairway dimensions to control human movement. Templer explains that ancient workaday stairs, like today's, had high risers and small treads to hurry people along. Ceremonial stairs had smaller risers and deeper treads to promote a pensive gait.

To get a bead on such tricks, he has scouted Europe, armed with a ruler. At Vaux-le-Vicomte (SMITHSONIAN, August 1983), the chateau completed in 1661 outside Paris for the lord high treasurer, who immediately afterward went to jail for embezzlement, Templer found that treads on a stairway descending into the main garden deepen as you go down. The aim, he believes, was to force arriving dignitaries into "an increasingly stately pace," at the risk of breaking an occasional royal neck.

Status stairs came into their own in the medieval period with the helical staircase. Building circular stairs requires advanced technical skills, and it was the rise of medieval crafts guilds that revved up the market. A classic helical stairway, at the abbey of St. Gilles du Gard, near Arles, had star quality: craftsmen from across Europe made pilgrimages to see it. Rich people showed off by putting helical stairs in their mansion towers.

In the Renaissance, many designers favored composite stairways of interconnected flights angling off from landings. At first, these complex stairways were used to add pizzazz to the era's grand gardens. But the designs soon invaded mansions and palaces, too. Designers experimented with stairs that clung to a wall on only one side, and then stairs with no walls at all. For Florence's Laurentian Library, Michelangelo created a freestanding grand stairway, with smaller flights going up along each flank. The secondary stairways showed off the central flight's monumentality. And uniformed footmen could stand on them, holding lanterns.

Stairs have served as theater seats, too, and as stages for public events. In Venice, the Scala dei Giganti (Stairs of the Giants) of the Doge's Palace were designed as the stage for the coronation of Leonardo Loredan. By the 1500s, a newly installed doge would sit regally at the top of the stairway to receive guests, who had to haul themselves up the flight to greet their new leader in an appropriately breathless state.

After the American and French revolutions, palaces were passé. The new hot spots were public buildings like museums or opera houses. And with ordinary Joes and Janes now thronging into government halls and other large buildings, stairs still had to be monumental—not to underscore the grandeur of kings and dukes but to handle the crowds. "Stair capacity became as important as location and effect," says Templer. And several 19th-century disasters—such as the 1876 fire at Brooklyn's Convoy Theatre, in which 283 people died—added to the importance of another stairway function, as fire escape.

Meanwhile, stairs have always had a purely esthetic side. They give architects a chance to experiment with diagonal lines, which Templer says have "shock value." He cites the Pompidou Center in Paris, where a suspend-

ed exterior escalator undulates diagonally up the building's face like an anaconda (SMITHSONIAN, August 1977). Helical stairs offer curves. Renaissance architects in France and Germany even prefigured the discovery of the molecular structure of DNA by designing stairways in the form of a double helix.

Renaissance architects were entranced with the analogy between steps and flowing water. They began to incorporate fountains into garden stairways or send water gushing along a flue down a stairway's center. By the Baroque period, at the Royal Palace at Caserta, in Italy, the real stairs were dwarfed by a huge water stair running down their center, the immense liquid steps receding to the horizon. In a different mood, the designers of the 1600s became playful with water at Villa Torrigiani, near Siena. There the host could wait until his lady guests in their satins and silks were descending the stairway into his garden and then turn on fountains hidden in the steps. He could direct these spurts to hound the women into fleeing this way and that among the flowers.

When they weren't playing water pranks, Baroque designers might fiddle with the balustrades, the railings running alongside the stairs, turning them into fanciful shapes. Balustrades of the vestibule stairway at the Palazzo dell'Università, built in 1623 in Genoa, end in life-size carved lions that seem to be braced against slipping down the final seven steps. At Prince Eugene's town palace in Vienna, sculptures of Atlas and Hercules strain to hold up the archways over the stairs, risking herniation. The balustrade at the Mirabell Palace in Salzburg is a frothy stone evocation of waves in which cherubs cavort, and where any stairway climber seeking a handhold is out of luck. By the 1800s, when Charles Garnier designed the Paris Opéra's foyer staircase as a kind of second stage where theatergoers might pose and preen, he could announce, "the Opéra is the staircase."

Today we might have to say "the skyscraper is the elevator" or "the shopping mall is the escalator." New materials like plastics and poured concrete let architects continue to experiment with stairs, making flights that seem inspired by Tinkerbell. John Templer points to Brasilia's Palace of the Arches, where Oscar Niemeyer designed freestanding concrete stairs–free of balustrades or railings–that twist upward as if levitated by helium.

"Structural pyrotechnics," says Templer.

For the stairstruck, the quest is neverending. At a new Harvard University art building, says Templer, an architect has created yet another stairway in the modern no-hands mode. Or so he has heard. He sounds wistful.

"I'd love to see that!"

Starkly beautiful as this staircase is, Templer spies a hazard: a large gap between the railings and stairs.

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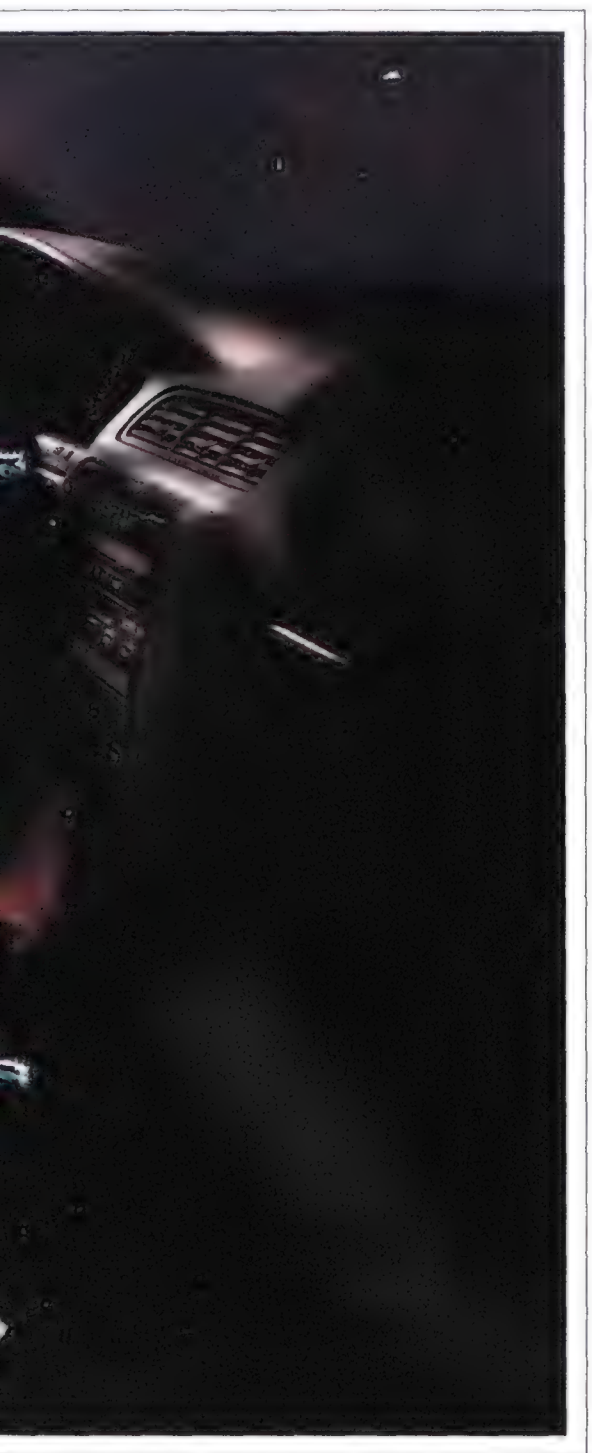

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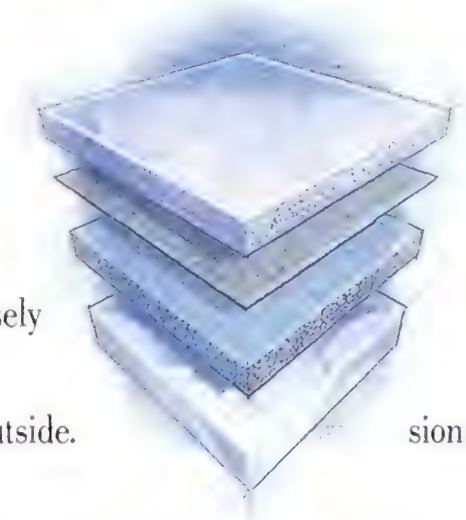

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Baroque spires of St. Vitus' Cathedral (opposite) and horizontal rooftops of Prague Castle keep watch over Hradcany–the castle district; nearby (above), John Lennon is memorialized in "street style."

'. . .All they are saying is Give Prague a chance'

American twentysomethings are flocking to the city of Vaclav Havel, Franz Kafka, old Beatles tunes and booming new businesses

By Stanley Meisler

In 1990, three young people of literary bent, typical of thousands more Americans, arrived in the shadowed, steepled city of Prague as it emerged from four decades of Communist darkness. John Allison, then 30, editing copy at *American Bookseller* magazine in New York, came in July for a scouting visit and returned in September. Dan De Luce, then 25, hoping to become a foreign correspondent like his uncle, arrived in October. Lisa Frankenberg, then 22, backpacking through Europe after her graduation from the University of California at Santa Barbara, arrived in November.

All three stayed in Prague–the city of Franz Kafka, the city of playwright-president Vaclav Havel–and live and work there now. They find themselves in a monumental city with a low cost of living and incredible openness to outsiders. Some commentators liken this phenomenon of Americans in Prague to those creative and celebrated days of the 1920s when Americans such as Ernest Hemingway and F. Scott Fitzgerald flocked to Paris with their movable feast after World War I.

The three Americans stayed in Prague for different reasons. The chance to take part in dynamic government excited John Allison, a bearded, bookish, articulate young man with flair and care for the apt phrase. "I freely confess to having romantic notions about being part of a new government," he says. Allison, who grew up in Pittsburgh, had met the mayor of Prague in New York at a conference on Czech literature. The American had little interest in Czech literature but was intrigued by what the Czechs call their "Velvet Revolution"–the massive, peaceful demonstrations in November 1989 that overthrew the Communist dictatorship and brought

Photographs by Jan Sagl/ Regina Maria Anzenberger

At Radost FX, a new nightclub, vegetarian café and record store near Wenceslas Square, a group of young people, many of them Americans, gathers on Sunday evening for poetry reading and good conversation.

forth democratic government. The mayor, a translator of American novels, promised Allison that his city had work for Americans. "Come to Prague," he said.

Allison went later that year. After several months of teaching English, he was appointed the mayor's "Chief U.S. Adviser," a job that mainly entailed helping officials write and read letters and other documents in English. After the mayor lost his seat in September 1991, Allison moved to the cultural affairs office of the president of Czechoslovakia, where he edited English translations of government publications.

"You could say I fell for the cliché that the Czech government is filled with intellectuals," says Allison, sitting in a functional office down a long corridor from the presidential office in massive Prague Castle. "But the cliché is nearly true."

The chance to report about Havel and his country for American newspapers kept Dan De Luce in Prague. De Luce, a tall, easygoing journalist who quit his job at the *Sacramento Union* after a change of management, wanted to model himself after his uncle and namesake, a longtime correspondent for the Associated Press. The young De Luce thought of setting himself up in South Africa as a freelancer. But a friend who was dating a Czech-American woman proposed Prague instead. "We can teach English. We can start a business. We can be journalists," the friend said.

So De Luce took a chance on Prague. After teaching English, he managed to put together a few strings, writing for several U.S. newspapers and for the *Prague Post*, one of two new English-language weeklies in Prague. "Once I came, I realized this was it," he says. "I have to admit I'm one of those Havel fans. I'm fascinated by a guy who conducts his political life on the basis of his personal life, on his beliefs. If I go home, what am I going to do–cover the city council?" He pauses to sip from his cup at the Hotel Europa coffeehouse on Wenceslas Square. "Anyway, I have a Czech girlfriend now. I'll never leave–I'm a prisoner."

The lure of running a business enterprise in a new society kept Lisa Frankenberg in Prague. After graduating from college, where she worked on the student newspa-

The author, who covers the U.N. for the Los Angeles Times, *visited Prague as often as he could while he was a Europe-based correspondent during the 1980s.*

per, Frankenberg decided to spend a year in Europe before starting law school. Eventually she gravitated to Prague–not that it was a goal. "I knew where it was on a map," she recalls, fielding questions in her crowded office in downtown Prague a block from Wenceslas Square. "My best friend had taught English there. I had read a couple of Havel's plays. I knew about the Velvet Revolution." But when she arrived, she quickly decided to stay. "I saw a market with a lot of potential," she says, "and I went for it."

With a few college friends and a little wordplay, Frankenberg started the newspaper *Prognosis*. But, in a few months, she grew dissatisfied because, as she puts it with her penchant for the entrepreneurial idiom, *Prognosis* "was not maximizing its business potential." So she and a partner founded another English-language newspaper, the *Prague Post*, a timely, newsy, business-oriented weekly. It is an obvious capitalist success in the capital of a former Communist state.

In some ways these young Americans do resemble the Hemingways and Fitzgeralds. But there's an interesting twist, says Josef Kroutvor, the curator of graphic arts at Prague's decorative arts museum. A scholar renowned for his grasp of the city's history, he surely has in mind the *Prague Post* and the New York Pizza restaurant and the Laundry King launderette and the new gay bar–all American enterprises–when he says with an ironic smile, "Americans are coming here like they used to go to Paris. But, while all the young Americans went to write novels there, now they all come here because they want to get into business."

That's a bit of an exaggeration. While everyone agrees that Prague, despite Havel, is no longer a city in literary ferment these days, no one can be sure what is brewing in the minds of all the young Americans there. But there is no doubt that Prague of the 1990s is far different from Paris of the 1920s. Paris had been a cultural and imperial capital attracting foreigners for several centuries, and the Americans were, in fact, laggard in showing up. In contrast, Prague has been hidden for the past half-century under Nazi boots and behind an iron curtain. Life was bleak, shops limited, tourists rare.

The streets are choked with tourists

All that changed with the Velvet Revolution. The world has rediscovered Prague. By 1992, some 1,200 Americans had registered with the U.S. Embassy as residents of Prague. Most officials estimate that the actual number is several times greater. Some accounts put the total as high as 30,000–in a city of 1.3 million. And that is only one side of the story. There are probably as many or more other foreigners living or working there, and the streets are so choked with tourists, most from Western Europe, that Prague sometimes looks like Venice in the

Inspired by Vaclav Havel, journalist Dan De Luce finds Prague's Old Town a big change from California.

Seizing on the wide-open business climate, Lisa Frankenberg cofounded two English-language papers.

John Allison recently became the editor of *Prognosis*; 15 of the newspaper's staff of 25 are Americans.

Martin Mejstrik, a student leader during the Velvet Revolution, says adjusting to the free market is hard.

summertime. More than 12 million visitors came to Czechoslovakia during the first three months of 1992. Almost all surely spent some days in Prague.

What they found was a city with the air of an international carnival. The streets brim with Czech street bands, Andean flute players, actors staging Three Musketeers swordplay; black marketeers selling caviar and Russian Army hats; a sightseeing beer wagon, pulled by draft horses, that supplies a can of pilsner to every tourist signing on for a ride; young people hawking tickets to English-language plays; and a host of street vendors offering Kodak film and postcards and trinkets and handicrafts and glassware and puppets, most advertising their wares in English. Locals have difficulty keeping appointments as they weave through packs of tourists, dressed in their funny hats and flowery shirts, on the narrow downtown pedestrian streets. "It is so crowded walking between 10 A.M. and 2 P.M. in the Old Town part of the city," says Roman Rehak, a 25-year-old Czech businessman, "that there ought to be a law that anyone with a tie has the right-of-way."

The backdrop to this merry cacophony is a city of astounding beauty, of spindly spires and shimmering towers, of dark passageways and shadowed streets, of great plazas and tight alleys, of cobblestones and antique cemeteries, of walkways across the Vltava River and down from Prague Castle, of Romanesque and Medieval and Renaissance and Baroque buildings that somehow clump together without clash–a city so exquisite that its portraits pale next to the reality.

In the days of Communist oppression, the Czechs had Prague practically to themselves. Few tourists came. At night, for example, anyone crossing the Charles Bridge, the city's famed pedestrian walkway with its Baroque statues of saints and its vista of the floodlit castle, could feel at peace and alone, a mood barely broken by the echoes of other footfalls.

After Soviet tanks suppressed what was known as "Prague Spring"–the attempt by Czech Communist leader Alexander Dubcek to reform and liberalize the regime in 1968–Czechoslovakia passed through some cruel periods of authoritarian rule. During those years, the bridge had special meaning for Iva Drapalova, a veteran journalist based in Prague for many years. "Walking across the Charles Bridge used to be a spiritual experience," she recalls. "When things were really bad in the 1970s and '80s, I would walk across and look at the statues and at the castle beyond and say to myself that all this is part of the Czech nation and that we will survive."

Nowadays, the Charles Bridge is so crowded at night that one can barely stroll from one end to the other. Enormous clusters of young people–mostly Czech, German and American–sit on the bridge singing to guitar music. The young Czechs seem caught in a time warp as they sing Beatles songs such as "Hey Jude" and "Can't Buy Me Love" in their accented English. "If I hear one more John Lennon song while crossing Charles Bridge," says John Allison, "I am going to smash a guitar." Despite the darkness, vendors sell postcards, jewelry, beer mugs, paintings, Kafka T-shirts and books.

Former playwright Vaclav Havel, leader of the Velvet Revolution, is now president of the Czech Republic.

Massive demonstrations in November 1989, like this one at the Letna Plain, led to government's downfall.

An outsider might expect the Czechs to be fed up with so many foreigners getting in their way. No doubt many of the natives, like Drapalova, have regrets about lost tranquillity and solitude. But on the whole, they don't resent the newcomers.

For one thing, they have other problems. Some of the joy of liberation has been offset by a mean-spirited revenge as many Czechs seek to break those among them suspected of cooperating with the discredited Communist regime. The net is so wide that fear is rampant. Everyone had to live with their Communist rulers for almost a half-century. "I don't like to quote Freud about a whole generation," says Rita Klimova, Havel's first ambassador to Washington. "But sometimes it's been sons getting even with their fathers. From a certain point of view, everyone over a certain age is tainted. Even Havel is tainted. After all, in the mid-'60s he made his living by writing plays that were produced during the regime."

Drapalova says that the published lists of those who cooperated are so long that they are meaningless. Yet, she was a little nervous one night when she knew that, the next morning, the newspapers were going to publish the list of Czech journalists who had cooperated with the Communist regime. Although she had never cooperated, she worried that some informant might have smeared her. Searching the list, she was relieved not to see her name. On reflection, however, she felt strangely isolated by the omission. "Every Czech who worked for a foreign news agency was on the list," she says. "I had this odd feeling that perhaps I should be on the list, too."

The Czechs also have to contend with the breakup of their country. At the end of last year, the Slovak third of the country seceded to become the independent Slovak Republic. Though they believe the Slovaks are foolish to leave, most Czechs have accepted the breakup without rancor. Yet it was not what everyone had in mind when they brought down the Communist regime in the euphoric and peaceful Velvet Revolution.

Perhaps the biggest reason that the Czechs don't resent the mass invasion of foreigners is because it symbolizes a reborn Prague. There's a feeling that the city is breaking from dark isolation and resuming its rightful place in the world. And the eager young Americans, many bent on opening shops and other enterprises, embody the new spirit of capitalism.

Asked whether he is troubled by seeing so many foreigners in the street, Josef Vavrousek, who served until recently as Vaclav Havel's Minister of the Environment, shakes his head emphatically. "It makes Prague more international," he says. "It's better." Viktor Faktor, a writer and translator now helping to run a bookstore, puts it this way: "Prague is like Sleeping Beauty. From time to time, it becomes an important city. Now is the right time for Prague to rise again."

There is a stirring nostalgia in this. Until World War II, Prague was one of the truly cosmopolitan hubs of Central Europe. "Prague was always an open city of three major groups–Czech, German and Jewish," says Josef Kroutvor. "The German and Jewish settlements had existed here since the Middle Ages. Kafka's friend Max

Bohumil Hrabal, whose novel was made into the film *Closely Watched Trains*, meets regularly with his literary cohorts at the Golden Tiger, an Old Town beer hall.

Brod called Prague a polemical city. This atmosphere prevailed until the start of the Second World War."

Vladimir Vodicka, the 68-year-old former director of the Theater of the Balustrade, where Havel got his start, describes Prague as a "mysterious city." Chain-smoking over coffee at the Hotel Inter-Continental, he adds, "You see, in a sense Czech nationalism does not exist. We have always been internationalist. For centuries we have lived on the crossroads between Germans, Jews, Slavs, even Spaniards. Of course, we lost the Jewish intellectuals in World War II, and Prague culture was based 40 to 50 percent on them."

The cultural diversity of old Prague can be felt by searching for the traces of Franz Kafka, the anguished Jewish writer whose dark, tense, symbolic tales in the German language have become a metaphor for the anxiety of the 20th century. During the 1970s and '80s, a visitor could take in these traces, but it was difficult. The Communist government's official guidebook to Prague, the only one on sale in the city, didn't even mention him. Although Kafka was not banned officially, government publishing houses let his major works lapse out of print. Nowadays it is much easier to find Kafka. Anywhere a tourist turns, in fact, shops and street vendors offer Kafka T-shirts, postcards, reproductions of his drawings and guide maps to his home and grave site. He is a tourist totem for the city now.

Czechs like Vodicka and Kroutvor hanker after the old cosmopolitan days, but they realize that times have changed. They look on the hordes of foreigners coming to Prague to gawk, invest or advise as a kind of substitute–a new worldliness to take the place of the old.

And while the young Americans don't come to Prague because of Kafka or Prague's old status as the great cosmopolitan city of central Europe, they do bask in the mood of the Velvet Revolution and of Havel. Prague spawned an astounding, almost bloodless break from tyranny in November 1989. This convulsion of society began less than a week after the Berlin Wall was breached, and these two momentous events surely symbolize the collapse of Communism and the Cold War more than any other.

Communist police, swinging their batons with brutal contempt and backed by reinforcements in armed personnel carriers, ignited the revolution with their suppression of a student demonstration on November 17. The blows felled the students even as they did little more than hold candles aloft or try to slip flowers onto the riot shields of the police. Furious student leaders vowed to retaliate with a general strike and a series of demonstrations aimed at bringing down the Communist government. The students joined actors and political dissidents in a new organization known as Civic Forum. It was led by Vaclav Havel, the playwright who had been jailed for more than four years for his role in the Czechoslovak human rights movement.

A series of massive demonstrations followed. On a crisp fall night, the day after Havel announced the formation of Civic Forum, thousands of people jammed into Wenceslas Square and were electrified by Havel's calm oratory. Wearing his familiar leather jacket, his light hair tousled by the breezes, he recalled the tragedy of 1968 when Soviet tanks rolled into Prague to put an end to the attempt by Czechoslovak leaders to liberalize

their Communism. "After 20 years," Havel said, "history is returning to our country."

The incredible excitement of those relentless days and the inevitability of victory has been recorded in a remarkable video, *November's Children. . .Revolution in Prague,* made by the Academy Award-winning American documentary director Allan Miller. The frustration of the Communist leaders is underscored in one wonderful scene when Prague Communist Party chief Miroslav Stepan addresses the workers at an iron mill on the outskirts of the city. Scorning the demonstrations, Stepan tells the crowd, "In no country on Earth do 15-year-olds make decisions about who should be president." This provokes a storm of jeering and whistling from the workers, who take up the chant, "We are not children." As Stepan feebly tries to explain that he was not talking about them, they drown his words with cries of "Resign! Resign! Resign!"

More than three-quarters of the country's workers joined the two-hour general strike of November 27. Within two days, the Communist government capitulated, letting power pass to the dissidents. A month later, the federal parliament elected Havel president. Smiling shyly, looking uncomfortable in a suit and tie, Havel told reporters, "Sometimes I have a feeling that I'll suddenly wake up in my prison cell, and I'll tell my fellow prisoners of my amazing dream of becoming president, and they will say, 'Come on, Havel, being a dissident has really gone to your head.'"

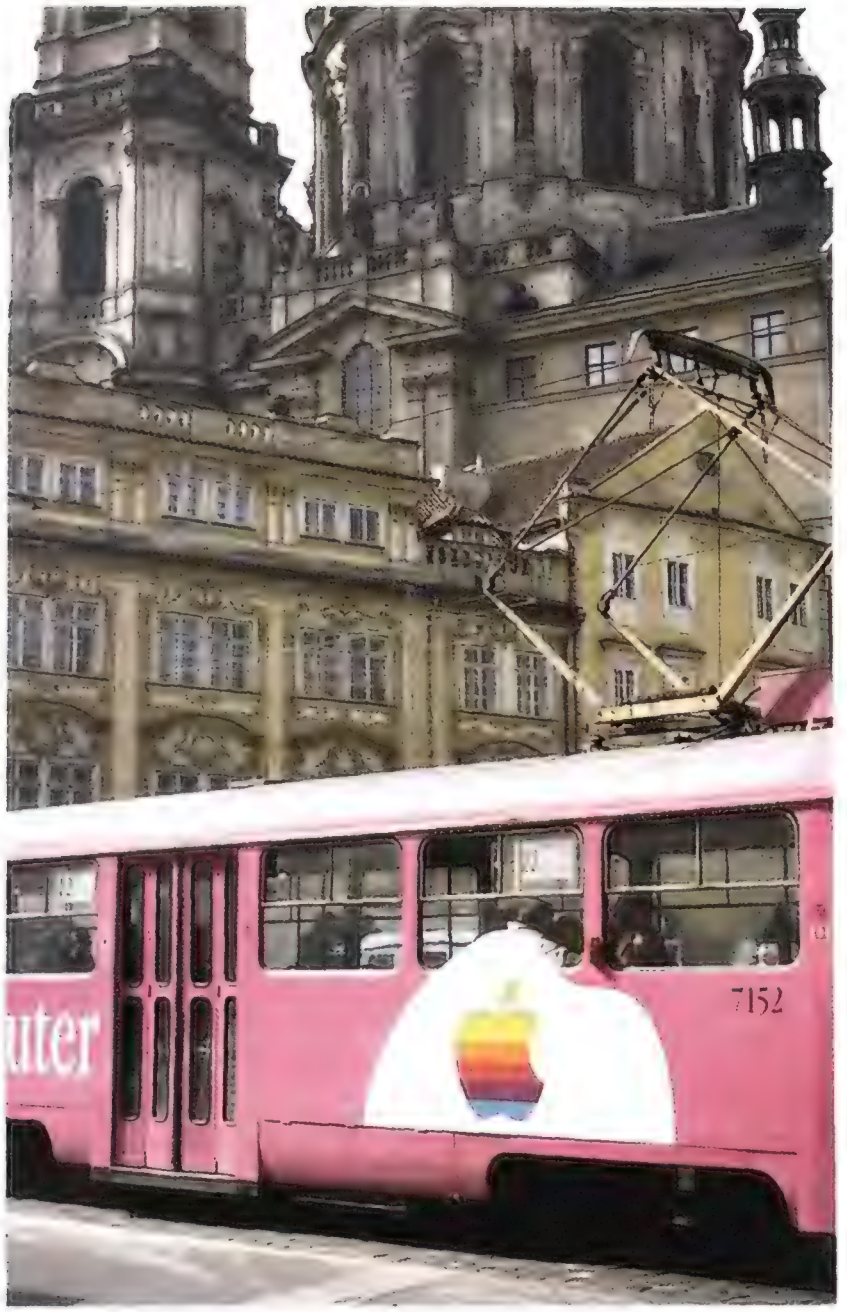
Street musicians in front of Prague's Old Town Hall are a common sight; '60s tunes are heard everywhere.

Charles Bridge was a quiet retreat for Prague's natives during the Communist regime; now it's usually crowded.

"It's not true that a politician must lie"

It is easy to see why young Americans are inspired by Havel. "Some say I'm a naive dreamer who is always trying to combine the incompatible: politics and morality," writes the 56-year-old playwright-politician in the recently published book *Summer Meditations.* "I know this song well; I've heard it sung all my life. . . . But it is simply not true that a politician must lie or intrigue. That is utter nonsense. . . . If you are modest and do not lust after power, not only are you suited to politics, you absolutely belong there. . . . It is not true that a person of principle does not belong in politics; it is enough for his principles to be leavened with patience, deliberation, a sense of proportion, and an understanding of others."

Last year, Havel had to lean heavily on these qualities as the elected leaders of what would become the Slovak Republic pushed for independence from Czechoslovakia. When Havel saw in July that it was inevitable, he resigned as president, three months before the end of his term. He didn't intend to preside over the dissolution of Czechoslovakia. In shirtsleeves, sipping wine, chain-smoking cigarettes, casually slipping off a shoe, Havel received well-wishers at the presidential summer residence in Lany a few days later. "I am free," he told them quietly.



Streetcar emblazoned with an advertisement is a new sight that some Prague natives don't like to see.

Summing up his administration for reporters, he said, "I could have done many things differently. On the other hand, if I'd done things differently, maybe everything would have been even worse." After the country split into separate Czech and Slovak republics early this year, Havel was elected president of the Czech Republic and returned to the presidential suite in Prague Castle.

No one expects Prague to suffer from the breakup. The Czech Republic will simply replace Czechoslovakia as probably the most vibrant country to emerge from Eastern European Communism. The Czech capital of Prague will simply replace the Czechoslovak capital of Prague. Aficionados of the city, in fact, are less concerned about the break with Slovakia than about the strange drying up of cultural life after the Velvet Revolution. This is surely the single most glaring difference between Prague of the 1990s and Paris of the 1920s. Although old-timers such as retired theater director Vladimir Vodicka and 79-year-old writer Bohumil Hrabal, whose novel was the basis for the film *Closely Watched Trains*, meet almost every day at U Zlateho Tygra (the Golden Tiger), a dimly lit beer hall in the oldest quarter of the city, and younger intellectuals frequent the cheap coffeeshop at the city museum, the fervor of earlier eras isn't much in evidence.

There are other signs that culture is down. Theaters have meager audiences, new books have few readers, painters have few patrons. Vodicka is philosophical about the decline. "We have no dollars," he says, "but the problem is not only economic. It's psychological as well. In the past, theater took the place of TV news. I do not mean that we actually informed people about the events of the day. In the theater, we could not say that Communist Party leader Gustav Husak was an ass. But with Shakespeare and Molière, we taught moral and ethical values. In a dictatorship, people need to renew their values. In a free market economy, people need to relax."

"I'm a bit afraid of commercialization"

Martin Mejstrik, who was a student leader during the heady days of the Velvet Revolution, believes that cultural life has simply failed to keep pace with the commercialization and Americanization that has swept Prague in the wake of the death of Communism. A gaunt young man with dark, intense eyes and a thin, self-deprecating smile, the 32-year-old Mejstrik was a drama student in 1989 and now edits a literary magazine. Speaking softly but eloquently, he tries to put the cultural problem into perspective. "I'm a little bit afraid of commercialization," he says. "I'm a little apprehensive that business may detract from the spiritual values that were built in Prague for centuries. Many people are afraid that Prague will cease to be what it was. I don't think that will happen, but many of us are in a state of shock over what the free market is doing."

Meanwhile, Americans can be spotted everywhere, stopping by the lavish new McDonald's off Wenceslas Square or taking their wash and their gossip to the new Laundry King. They hang together, partly because there are so many, partly because they sometimes need to escape the frustrations of work. "There's no formal organization," says John Allison. "But a lot of Americans live here." Many teach English—the most available job in Prague for an American. Other Americans usually refer to them as the "English-teaching crowd," a group that seems to switch its hangout every few weeks. "I hate to mention these places," jokes Lisa Frankenberg. "By the time an article comes out the crowd has gone elsewhere."

The Americans find Czech a difficult language to master, and many bemoan their lack of fluency. "My shame here," says John Allison, who is now editor in chief of *Prognosis*, "is that I know so little Czech." When Martha Pinder of Grinnell, Iowa, arrived in Prague at the beginning of 1991, she took a job teaching English to employees of a newspaper for a thousand crowns a month (about $35 at the current exchange rate). "That was

pocket money," she says. The newspaper was just starting to use computers but could not use her to help set them up. "I was better at computer publishing than most people on the staff," she says. "But without the language what can you do?" The 31-year-old Pinder, who later worked for the *Prague Post* for ten months, has far more control of the language now. "The Czechs flatter me," she says. "They tell me, 'You speak Czech better than the other Americans.'" Pinder says that she is so used to the continual changes in Prague life that she sometimes walks downtown and fails to notice the latest transformation. "Now I'm just like a *Prazacka*–a resident of Prague," she laughs.

Even after a long stay in Prague, many of the young Americans still feel enthralled by its beauty. "Prague is beautiful," says Dan De Luce. "But it's not beautiful in the way that Greece or Santa Barbara are beautiful. It's intriguing. It's a melancholy city. I love walking about it in the evening, even in the rain. This is a hopeful place, despite all the problems."

Can the commercialization of Prague get out of hand? In a spoof that ran in *Prognosis*, John Allison, then working for the mayor, claimed to have received a business proposal from the Walt Disney Company. Disney intended to buy Praha (as Prague is called in the Czech language) and turn it into Prahaland. All Prague natives would become employees of Disney. While Prahaland would use English as its native language, the natives, when not in Disney uniforms, could speak Czech among themselves to give the site a realistic atmosphere. The monuments of Prague would be "upgraded to Disney standards." A monorail would move across the Charles Bridge, and "a gala re-creation of the November 1989 demonstrations" would take place every day in Wenceslas Square.

No Czech is worried enough to write a spoof like that. The city lived too many years in harshness and isolation, ruled by cruel hands that gnarled spirits and shut the city off from outsiders. Now, a heady mood of discovery pervades the atmosphere. While Americans and other foreigners are discovering Prague after its years in obscurity, the excitement is helping the people of Prague rediscover their city as well.

In 1968, Wenceslas Square witnessed the brutal end of Prague Spring as Soviet tanks rolled through. A quarter-century later, an informal memorial has been set up there to honor the victims of Communism.

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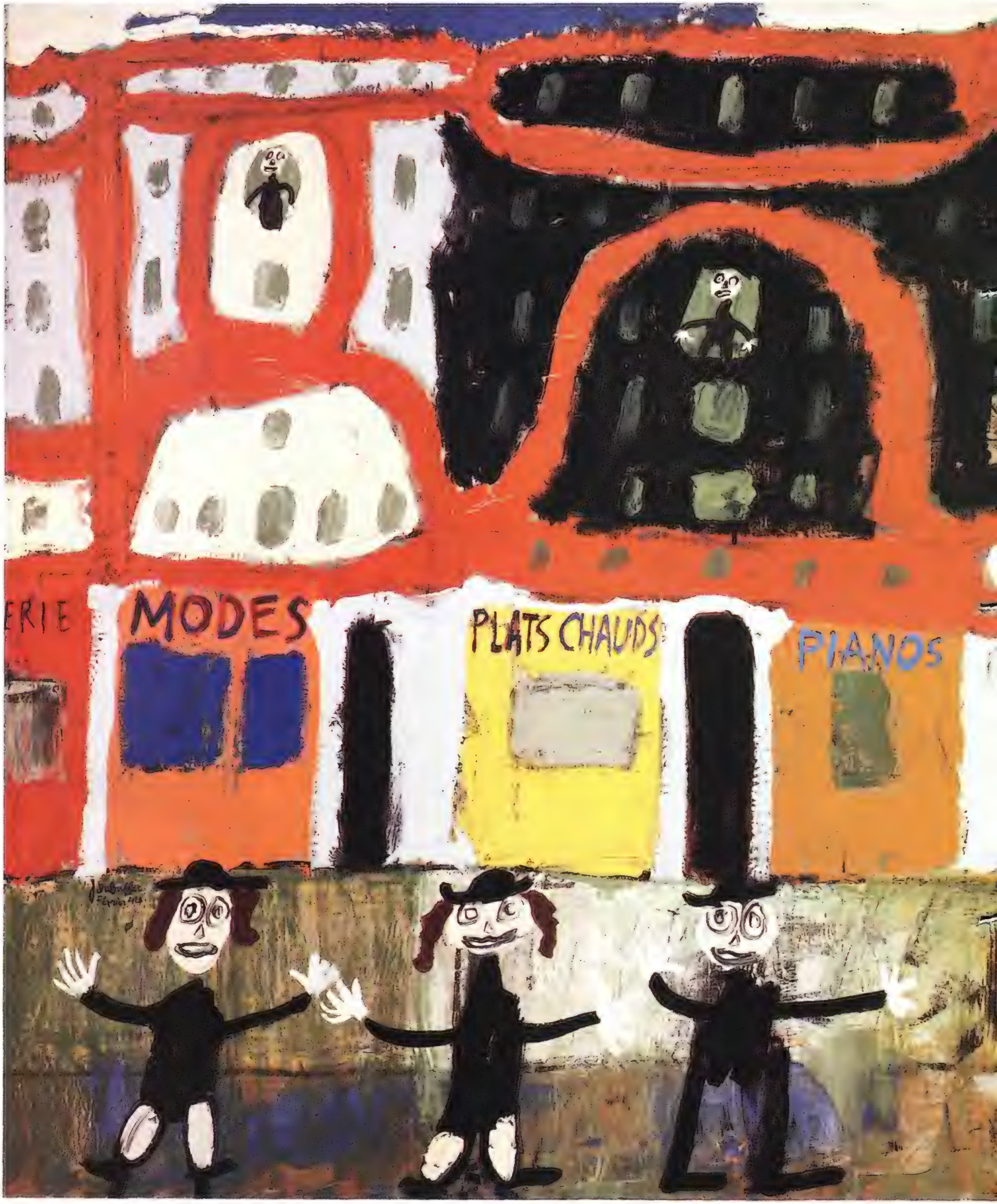
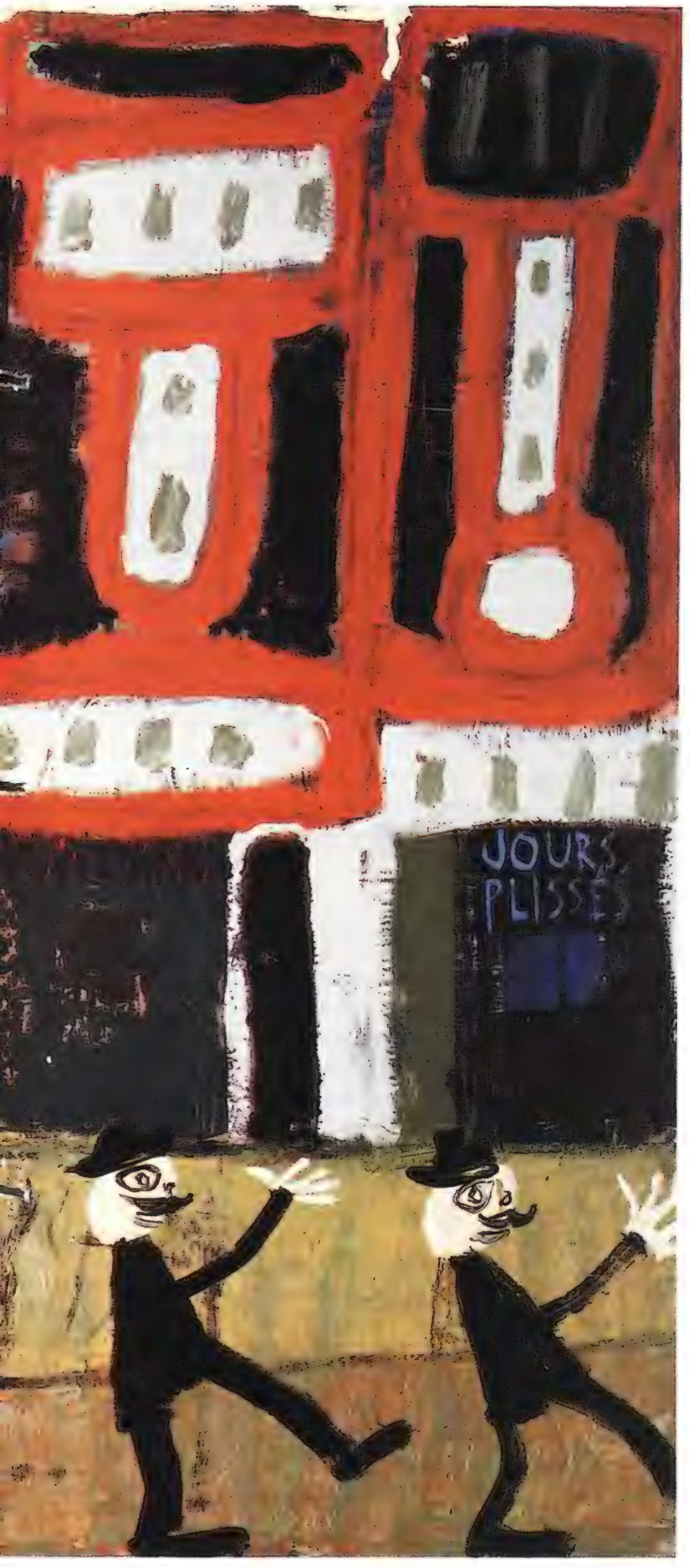




By Helen Dudar

Art that can 'make people laugh and frighten them, too'

Jean Dubuffet, the 'Tender Terrorist,' gave us painting in the raw and on the edge, but in time the art world caught up with him

In his final year, when he was burdened with age and emphysema, Jean Dubuffet made his last paintings. They were his farewell statements: angry scrawls of color charging across dense black backgrounds. He was 83 years old and, he announced, he would paint no more. His American dealer, Arnold Glimcher, visiting Paris in 1984 to arrange the next Dubuffet show, found the new works disquieting. They evoked parched dried leaves, and it struck him that they granted the viewer no breathing space–a deft metaphor for the art of a man who was smoking himself to death.

Dubuffet often attached an arcane or melodramatic label (*Matériologies, Texturologies*) to each new phase of his work, and this final series was to be called *Non-lieux*. Planning to install the works in the Pace Gallery, Glimcher needed a translation. *Non-lieu*, he learned, is the term in French jurisprudence signifying that, for lack of sufficient evidence, a trial has ended without a verdict. "You see," Dubuffet said with his customary fine irony, "at the end of my life, there isn't even the satisfaction of having been guilty."

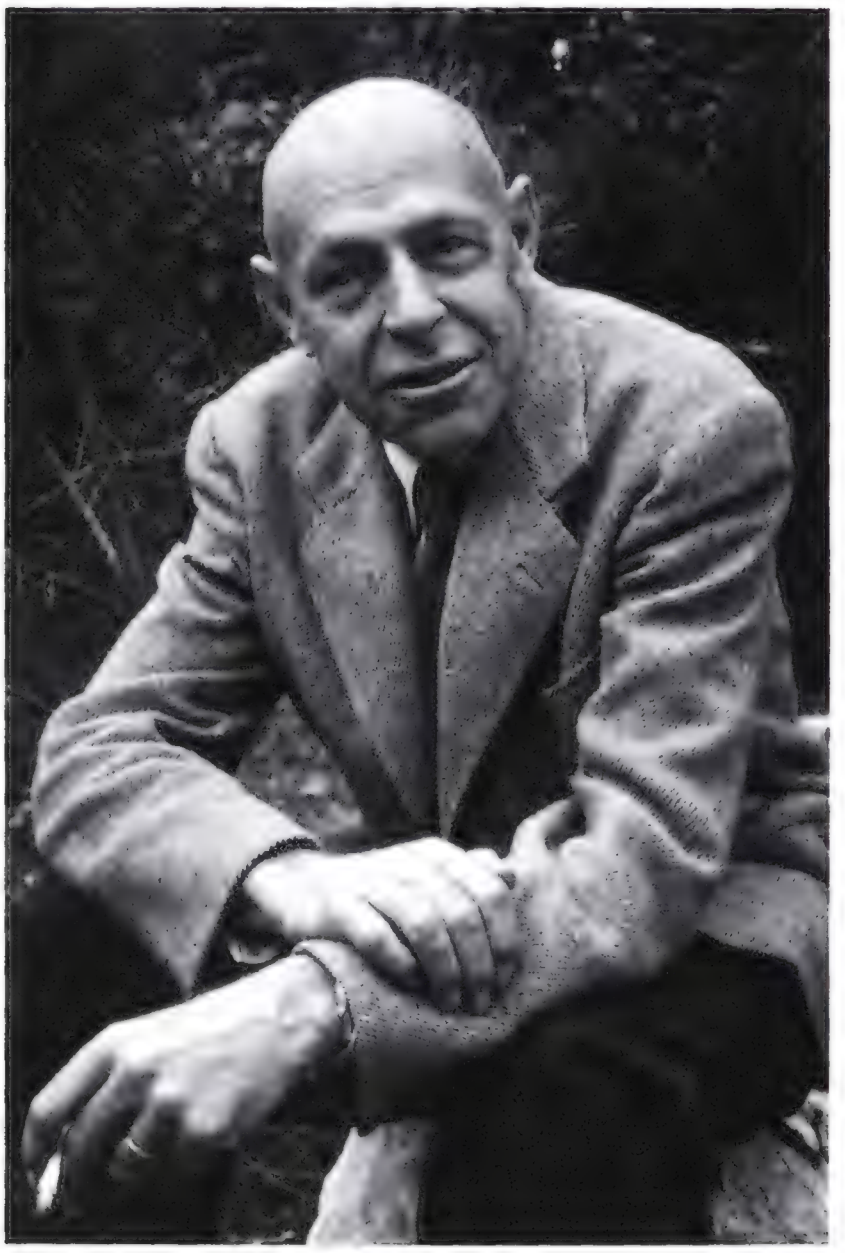
Now here was an entirely uncharacteristic display of modesty. In a public career embracing more than four decades, Dubuffet was at least guilty of a galaxy of cultural transgressions. He had set out in the early '40s to

Dubuffet's vivid intensity–as in an early work, *View of Paris, The Life of Pleasure* (1944)–never slackened.

Dorothea and Natasha McKenna Elkon Collection, New York

Fautrier with Wrinkled Brow (1947) is one in a series of portraits in which the artist tweaked his friends.

A small, bald man with a huge smile, Dubuffet was uncompromising but had a strong sentimental streak.



subvert conventional notions of beauty, producing imagery that was seen as brutal, shocking, violent and grotesque. Some of his work actually drove the critics to nasty latrine language. Yet, it also bewitched a modest number of astute collectors into obsessive accumulation of Dubuffets. And, by example or osmosis, it instructed the next few generations of younger practitioners that anything–any image, any material–may be productively considered for the creation of art.

Dubuffet portraits looked to the earliest viewers like the scrawls of a wicked child. They were gouged into surfaces that had been encrusted with sand and tar, and sometimes pebbles and string, and even splashes of concrete. He made pictures using butterfly wings and tobacco leaves; he created textures by attaching steel wool and crumpled aluminum foil to canvas; he fashioned sculptures from sponge and driftwood and furnace slag.

Like Picasso, who lived and worked for more years, Dubuffet was a highly productive artist, turning out art in huge quantities. He hardly ever stopped creating. By rough estimate, there are more than 10,000 paintings, drawings, prints, assemblages, sculptures and assorted unclassifiable objects in homes, museums, storage and public plazas here and abroad. A small and nicely digestible sampling–just under 100 pieces–will be on display this summer from June 17 to September 12 at the Smithsonian's Hirshhorn Museum and Sculpture Garden in Washington, D.C. The show will not travel, and it will cover only the first half of Dubuffet's career, from 1943 to 1963, a period that some of his admirers favor over the later work.

An international explosion of interest

It is the city's first major exhibition of Dubuffet, merely one phase of what amounts to an international explosion of interest. In the past four years, there have been big retrospectives in Rome, Frankfurt and Barcelona, and in 1994, major museums in Paris and Zurich will be installing great feasts of the work.

Anyone requiring a reason for this will find useful hyperbole in most of the authoritative surveys of the art of our time. Many scholars at least agree with the Hirshhorn's director, James T. Demetrion, who organized this show and who believes that Dubuffet, along with Alberto Giacometti (SMITHSONIAN, September 1988) and Francis Bacon, must be counted "one of the key figures in European art of the postwar period." Others take the assessment a step further. Thomas Messer, who arranged a memorable Dubuffet retrospective in New York in 1973 when he was director of the Solomon R. Guggenheim Museum, believes that Dubuffet "is *the* great artist of the second half of our century. I think he's a magnificent figure, unmatchable really."

The public first encountered Dubuffet at a one-man

Richard S. Zeisler Collection, New York

In his whimsical 1946 painting *Touring Club*, Dubuffet was reported to have shown himself as the hood ornament. When asked if this was true, he answered, "Yes, now you can see whether I am a good artist or not."

gallery show in Paris in the fall of 1944, a few months after the end of the war in Europe. The critics were cool; oddly enough, a few collectors embraced the art at once and paid tidy sums of francs for it. Less than two years later, at the next show, a guard had to be posted in the gallery; the uniform failed to deter at least one enraged visitor bent on inflicting knife wounds on a canvas. Again, there were admiring buyers, and again, violent objections from the experts. One journalist-critic observed that in the wake of *dadaisme*, Dubuffet had perpetrated *cacaisme*. His 1947 New York gallery debut actually occasioned earnest protest from *Life* magazine, a crabby little editorial with a headline that complained: "Dead End Art: A Frenchman's Mud-and-Rubble Paintings Reduce Modernism to a Joke."

The work was rough, even raw, with raucous homage to urban graffiti. Years before, Dubuffet had been deeply impressed by a German psychiatrist's study of the art of the mentally disordered. He called it *L'Art Brut*–"Raw Art"–and in the coming decades would obsessively accumulate an immense collection of work produced by the insane, prisoners, clairvoyants and others uncorrupted by textbook notions of what may properly be chalked on walls, sidewalks and paper. His own work could not be classified as *L'Art Brut*, since Dubuffet was neither untrained nor certifiably deranged, but it came as close as these handicaps would allow.

Helen Dudar last wrote on Griot New York, *a dance collaboration between Garth Fagan, Wynton Marsalis and Martin Puryear, in September 1992.*

In a time when abstract art pretty much dominated the gallery world, Glimcher points out, the immediate impact of Dubuffet's work was to "open a new route to the figure." His impact on contemporary artists was "spiritual, rather than direct," according to Demetrion. Perhaps most important was his liberating influence. As Katharine Kuh, an art historian and a Dubuffet friend, observed, his gift, if any, to contemporary artists was a "disregard of conventional rules." This anarchic spirit inspired some of his intimates among Paris' men of letters to write admiring articles describing him affectionately as "Dubuffet the Terrible" and the "Tender Terrorist." He repaid their support by making them look awful on canvas.

Almost inevitably, Dubuffet the rule-bender was the product of a serious, bourgeois family rooted in Le Havre and devoted to the domestic comforts provided by a thriving wholesale trade in wines and liquors. He once told an American journalist that he hated his "merchant family," and he appeared to have eventually severed relations with them. When he was well into his late years, Dubuffet traveled to Le Havre to inspect a museum retrospective of his work and, as he rounded a corner of a gallery, encountered an extremely elderly woman examining a painting. The woman turned out to be his mother, then not far from her hundredth birthday; they had not met for years. As he related to Glimcher, they had a "very nice conversation." Then he went back to Paris and never saw her again.

Dubuffet had left home at 17 to study art in Paris; dissatisfied with formal instruction, he abandoned school within months and gave up painting completely a few

Collection of Mr. and Mrs. Harry W. Anderson, Atherton, California

Body of a Lady Rose Incarnate is an assault on the Western tradition of the female nude–not on women.

years later. In the next quarter of a century he traveled abroad; got married, fathered a daughter and was divorced; launched and abandoned a couple of wholesale wine businesses; and took up and stopped painting a second time. Finally, in 1942 at the age of 41, he decided that he wanted to spend his life creating art. A man of formidable intelligence, an autodidact, Dubuffet had also, by then, learned his way into most of the arts. He wrote with professional skill, and he seemed to acquire languages with the ease of a gardener gathering flowers. For a period in the late '40s he made several painting expeditions to the Sahara Desert, and to smooth his sojourns applied himself successfully to learning Arabic.

As a maker of and writer on art, Dubuffet was a world-class contrarian, a killer iconoclast. He was anti-academy, anti-establishment, anti-history–in short, irrevocably opposed to cultural traditions as the Western world defined them. Painting, he argued, required neither schooling nor inborn talent. "Everybody in the world is a painter." Drawing from life was stupid. Most accepted work, including contemporary avant-garde art, was hardly worth looking at: "It suffers from being a house plant. . .made *by* and for. . .initiates." In what was a sketchy but apt description of the impact of some of his own work, he wrote, "Art should always make people laugh a little and frighten them a little."

Pridefully, Dubuffet insisted that he never visited museums or galleries, although he seemed to know everything worth knowing about art of the past. When he did break his rule and visit the Guggenheim, Messer remembers, he walked past a wall of someone else's paintings with one hand shielding his eyes from the offending sight. He did find a few contemporaries acceptable. He approved of Claes Oldenburg, who, in his earliest work, was an unabashed devotee of Dubuffetism. But what most excited Dubuffet was art that he saw snaking along the borders of madness–the mysterious, skewed world embedded in Louise Nevelson's black wooden constructions; the decay-riddled, death-obsessed imagery of Ivan Albright. Indeed, for Albright, whom he met on a 1951 trip to Chicago, Dubuffet did the unthinkable: he wrote a gushing forward to a book on the painter's work.

Nothing excited Dubuffet's contempt as much as classical Greek and Western standards of female beauty–an esthetic he considered miserable and depressing. "Surely I aim for a beauty," he said, "but not that one." People, he complained, insisted on misunderstanding him; they thought he found pleasure in wretchedness. Actually, "I wanted to show them that things they consider ugly and have forgotten to see are really sublime wonders."

Dubuffet was not a paragon of consistency. Lili Carlu, the woman who became his second wife, for example, was an acknowledged beauty, a spiritual twin to Man Ray's "Kiki of Montparnasse." Both were celebrated models in the '30s in the studios of that bohemian Paris district. One of the few examples of Dubuffet's early work that he did not destroy is a fairly academic, skilled oil portrait of a young, luscious-looking Lili.

Hardly anything dismayed the gallery-going world more than the blatantly unbeautiful series he called *Corps de Dames* (*Ladies' Bodies*), nearly three dozen paintings turned out at a brisk pace in a few months of 1950.

Private collection

Light-hearted *Cow with the Beautiful Muzzle* (1954) depicts an animal that gave Dubuffet a calm feeling.

Private collection, New York

In *Beard of Stubborn Refusal* (1959) the artist used a fragment of an earlier work for the beard itself.

They were memorably unladylike–savage images of nude women with deformed, bloated bodies, wearing such titles as *Miss Spider, Piece of Meat, The Hairy One* and *Landscaped Ruddy and Garnet Red.* To some observers, the works suggested a strident hostility to women. On the other hand, the female imagery was hardly more grotesque than many of his male figures. Dubuffet, of course, felt his ladies had been misunderstood. Having portrayed women no one would have coveted, he explained, "They are not objects of lust and carnal possession, but *places* of celebration. . . ."

In truth, in Dubuffet's earliest works people also resemble places, an important detail that tends to disappear in reproduction. His surfaces are alive with textures–vibrant swirls and lumps of darkish, dense materials lit by sudden dashes of sumptuous color. The textures somehow transform a painting so that a human figure is both a portrait and a landscape, a kind of lunar garden brimming with secrets. (And, since they don't come on the market very often, they command splendid prices, even in a depressed economy. At a dealers' art fair in New York this year, the price tag on a fine 1947 oil portrait of a male friend was $1,850,000.)

In the early years, Dubuffet produced singularly unflattering portraits of members of his intellectual circle, images not taken from life but dredged out of the unconscious, or, as he put it, likenesses "cooked" and "conserved in the memory." Apparently no one complained openly, not even Pierre Matisse, who was repelled by the look of meanness Dubuffet had given his caricatured face. Matisse, who was the son of Henri Matisse, was Dubuffet's first New York dealer. He was too circumspect to tell the artist he hated the picture. An epiphany would come many years after he had first seen it. As he once told the story to a client, Matisse was sitting on the bed in a Paris hotel room one day, talking on the telephone, when he happened to glance up at the mirror across the room. The expression he saw was transfixing: it exactly matched the one in the painting that Dubuffet had titled *Dark Portrait.* Some subjects were treated with humor if not with tenderness. In 1954, Mme. Dubuffet, who was fragile physically, was sent away from Paris for a rest cure. On his walks through the countryside during his visits, her husband was captivated by the cows in the fields. The result was a succession of charming, funny paintings of deeply dopey bovine creatures.

A few years later, he was taken with beards, big beards and odd beards that, picture after picture, became far more important than the faces of the men wearing them. In 1961 he hurled himself into a cityscape period or pos-

Business Prospers (1961) depicts the same city as *View of Paris*, painted 17 years earlier. But this work is far more raucous, with its jumble of forms, and signs bearing epithets such as "Swindler" and "Rotgut."

sibly an anti-cityscape period. The paintings were busy, crowded patchworks of scenes of people in buses riding past stores and buildings bearing imaginative signs. In the painting he called *Le Commerce prospère* (*Business Prospers*), the company signs advertised "Cad and Company," "Shameless RiffRaff," "Swindler" and "Rotgut" and "Ministry of the Greased Paw."

By the time these pictures were ready to be shown, Matisse and Dubuffet had parted company for reasons never specified. It has been suggested that the rupture might have had something to do with the fact that by 1958 the dealer had stockpiled more than 200 Dubuffets for his own inventory. Although it looked as if he counted on a price explosion in the Dubuffet market, Matisse, in fact, was famously reluctant to part with art he had acquired for gallery stock. Morton Janklow, the New York lawyer and literary agent whose apartment walls are crowded with several dozen Dubuffet works, once courted him for months in pursuit of a painting that Matisse had shown. Janklow suspected the owner was Matisse himself, but the dealer would never admit it. When Janklow finally was allowed to buy it–a masterwork titled *L'Extravagante* (*The Extravagant Lady*)–he was astonished to find the price eminently fair.

If Dubuffet could be unforgiving–and by some accounts difficult, demanding and irascible–he was also easy prey to sentiment. Linda and Morton Janklow opened a package one day and found a delicate gouache commemorating their wedding anniversary. When Maurice Culberg, a Chicago asbestos manufacturer who had been one of his earliest American enthusiasts (and who had acquired 44 Dubuffets in a few years), fell ill, there was a get-well present: an engaging and now famous picture assembled out of butterfly wings (p. 86). And after Culberg's death, when his teenage daughter, Franka, went abroad for a year in Paris, she spent the first three months as a guest in the Dubuffet home. Like any proper bourgeois, Dubuffet, this symbol of anarchy in art, be-

Private collection

With ten-foot-wide *Tide of Hourloupe* (1963) and other works in the *Hourloupe* series, Dubuffet moved into big panels. The interlocking hard-edged design, like a giant jigsaw puzzle, grew out of doodles on a notepad.

came a standard, concerned father figure: he worried when she stayed out late.

He looked like a creature of the forest, a small onion-bald man with large winglike ears and large teeth that sometimes could make the large smile seem vaguely menacing. Even as Dubuffet grew prosperous, he clung to the cheese-paring habits of wartime France. A pair of visiting teenage sons of American friends were treated to charm and lunch in the elegant court garden of his house on the rue Vaugirard; the food was served with a wine that Dubuffet actually boasted was *vin ordinaire*, the cheapest vintage, which householders bought by carrying bottles for refills to the neighborhood wine merchant. On one visit, Morton Janklow was astonished to discover that this successful artist drove a Deux Chevaux, the toylike chug-chug vehicle that the least-monied Frenchman acquired when trading up from a bicycle.

On the other hand, expense was never spared for the creation of art. In addition to the work space in his home, there were several other studios both in Paris and outside the city. Moreover, Dubuffet left nothing to chance. Catalogues raisonnés, summaries of a life's work, are usually posthumous affairs. In the '60s, Dubuffet set about arranging his posterity: two full-time employees tended a record of every piece he had ever made, and a Belgian scholar, Max Loreau, was assigned the job of organizing the effort and writing essays. In Dubuffet's lifetime, there would be 37 volumes–somewhat pretentiously called *fascicules*–with dated photographs of all his work or blank spaces denoting missing pieces. There would also be occasional comments by the artist, lists of owners of his art and, most engaging of all, snippets of press reviews neatly balanced between praise and vicious insult.

Even victims of his need to control could not help admiring his steely resolve. When Tom Messer was preparing the Guggenheim show that would also travel to the Galeries Nationales du Grand Palais in Paris, Dubuffet

Hirshhorn Museum and Sculpture Garden

Dubuffet sent collage *Personage of Butterfly Wings* to American collector Maurice Culberg as get-well gift.

had to be cajoled into cooperating. For him, the work of the moment was always more interesting than last year's art. Midway in the long preparatory period, he wrote to tell Messer that he had begun a project that he wanted included in the show. No problem, Messer said, innocent of what the future held. Gradually he learned it was a theater piece called *Coucou Bazar*, and that it would require stage sets, performers in costume, an acre of additional space and a bundle of money—about double what was already an unmanageable budget.

Messer was finally to understand that in any conflict, Dubuffet required—actually, demanded—victory. "Ever so politely, in his exquisite French manner, he put before me an unstated ultimatum. *Either you do the first* Coucou Bazar *in its fullness together with the show or the show is off.*" *Coucou Bazar* ran on Dubuffet's terms, and Messer, who had always been an admirer of the artist's, actually managed to forgive if not to forget the grief it caused him and his French colleagues.

The Hirshhorn exhibition stops at the start of a new cycle for which the *Bazar* sets and costumes were a climax of sorts. The last three pieces in Demetrion's show are paintings in the style Dubuffet called *Hourloupe*, an invented word that someone once noted resembled *entourloupette*—"swindle" in French slang. The designs were high-concept doodles, interlocking cells in three colors—red, blue and black—plus white, usually with stripes running in different directions. Although the work looked abstract, imagery was often hidden in a piece. In good time, *Hourloupe* graduated from easel works to extremely large panels to sculpture, then to theater and even to architecture. The world's largest *Hourloupe* is the Villa and Closerie Falbala, a sprawling building with *Hourloupe* furnishings, standing outside Paris on property that also held one of Dubuffet's studios.

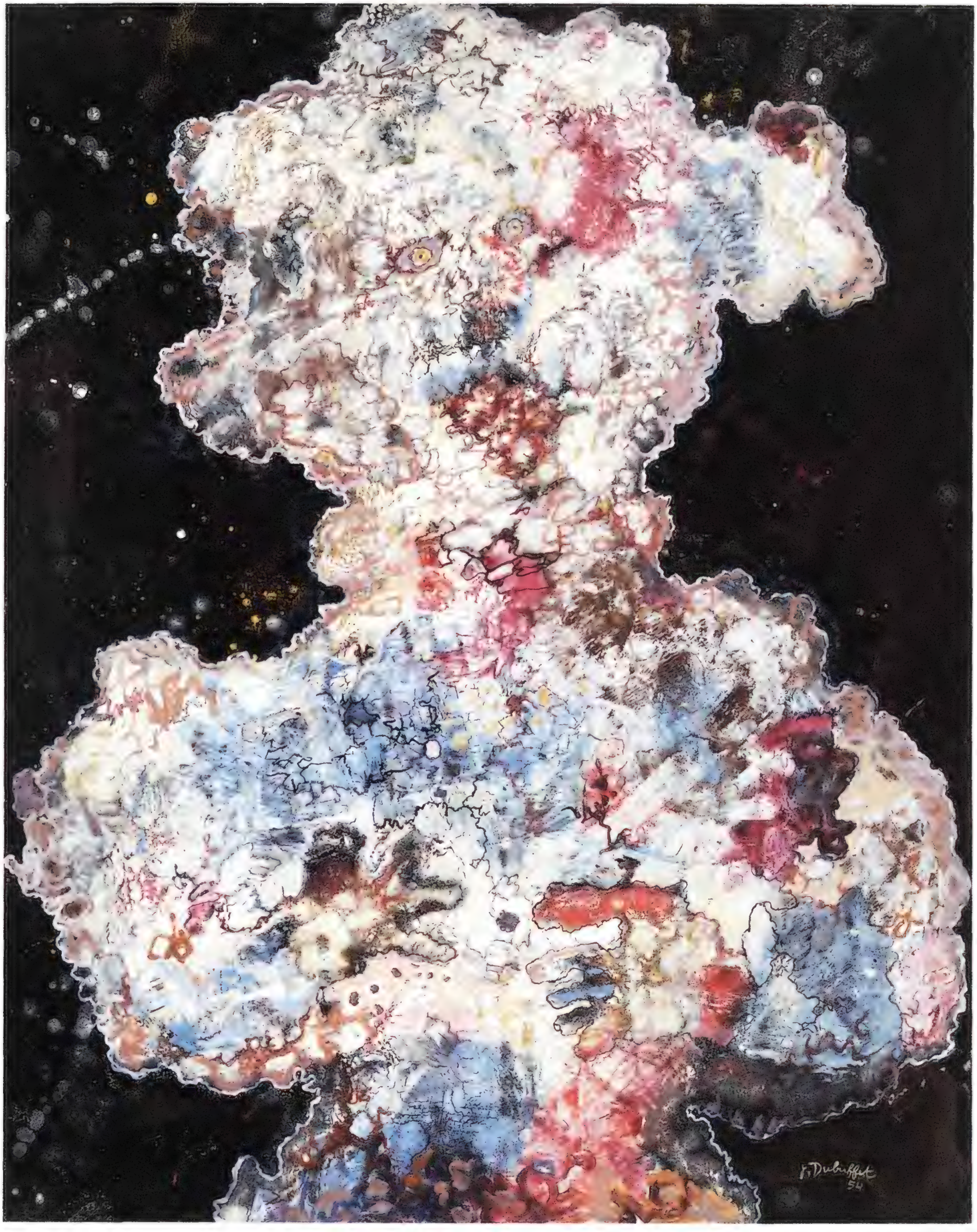
The *Hourloupe* phase was unusual in that it commanded Dubuffet's interest for a dozen years instead of a few months. It also brought him into the orbit of big business and popular collecting. The man who despised every centimeter of the contemporary art scene eventually accepted commissions from major corporations to design immense outdoor pieces, some of which can be seen in public places scattered throughout the United States. Collectors who could never have been persuaded to give wall space to the early works took to and bought the *Hourloupe* paintings; they were decorative, even cheerful (although on close inspection, those agitated designs turn out to be far from soothing).

When that phase ended, Dubuffet returned to new variations of the old graffiti paintings and later moved into an abstract vein that would end with the *Non-lieux*. Despite the emphysema, despite a painful spinal problem that caused a severe stoop, he turned out work at nearly the same old feverish pace. One year, when he reported that he had completed a series he called *Psychosites*, Arnold Glimcher came to Paris to select works for a new show. Without comment, he passed up several pieces that he thought were less successful. ("You had to be careful," Glimcher acknowledged recently, "because sometimes the 'awful' work was really great work and you just weren't ready for it.") Watching Glimcher make a selection, Dubuffet magnanimously pressed him to take "some of the bad ones. It would be interesting for people to see how badly I can paint."

Later, when he said he was renouncing his life as an artist, Dubuffet reminded Glimcher that he had painted every day of his life for more than 40 years. In his deadpan style, he went on to observe that a work schedule of that sort could not be good for a person's health. In the months before his death in May 1985, Dubuffet wrote his autobiography. On his instructions, it may not be published until every person mentioned in it is dead. The 21st century may be in for a big treat.

New York collector Morton Janklow fell in love with *The Extravagant Lady* (1954) and finally won her hand.

Mr. and Mrs. Morton L. Janklow, New York



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Metropolitan Museum of Art

Leading a procession, four late Bronze Age Nubian princes bear rings and bags of gold to Egyptian ruler.

By David Roberts

Out of Africa: the superb artwork of ancient Nubia

The rich heritage and tradition of this venerable, long-neglected civilization beside the Nile is now celebrated in four great Western museums

A chariot-borne Nubian princess follows, in detail of facsimile of wall painting in royal tomb of Huy, Thebes.

To the ancient Greeks and Romans, Nubia was one of the foremost civilizations of the world. Because its domain lay on the edge of the unknown—south of Egypt, along the tortured cataracts of the upper Nile, where few Greek or Roman travelers had ventured—Nubia shimmered with legend. But there was no mistaking the area's might or wealth.

For centuries, exotic goods had flowed north in an inexhaustible stream from this African font: gold, frankincense, ebony, ivory, panther skins, giraffe tails and hippopotamus teeth. Brave mercenary soldiers, virtuosos of the bow and arrow, also traveled north out of the storied land. Herodotus described Nubians as the "tallest and handsomest" people in the world, adding that they reputedly lived to an age of 120, thanks to a diet of boiled meat and milk. Roman chroniclers reported that the southern empire was ruled by queens. From their own artwork, we know that the Nubian ideal of female beauty put a premium on fatness. Indeed, the sardonic Juvenal claimed that the breasts of Nubian women were bigger than their chubbiest babies. Writing in the third century A.D., a romantic biographer of Alexander the Great insisted that in Nubia there were whole temples carved from a single stone, and houses with translucent walls; the queen traveled in a mobile palace on wheels drawn by 20 elephants.

Although these accounts veered into the fabulous, Nubia was no mere phantasm of the poets, no El Dorado. Within Nubia, stretching along the Nile from present-day Aswan in Egypt to Khartoum in the Sudan, at least six distinct, supremely accomplished cultures evolved between 3800 B.C. and A.D. 600. Nubian civilizations lasted far longer than either classical Greece or Rome. Always a rival to the kingdom to its north, Nubia conquered Egypt around 730 B.C. and ruled it for the following 60 years.

Ta-Seti or Yam or Wawat

Why is it, then, that most of us today have barely heard of Nubia?

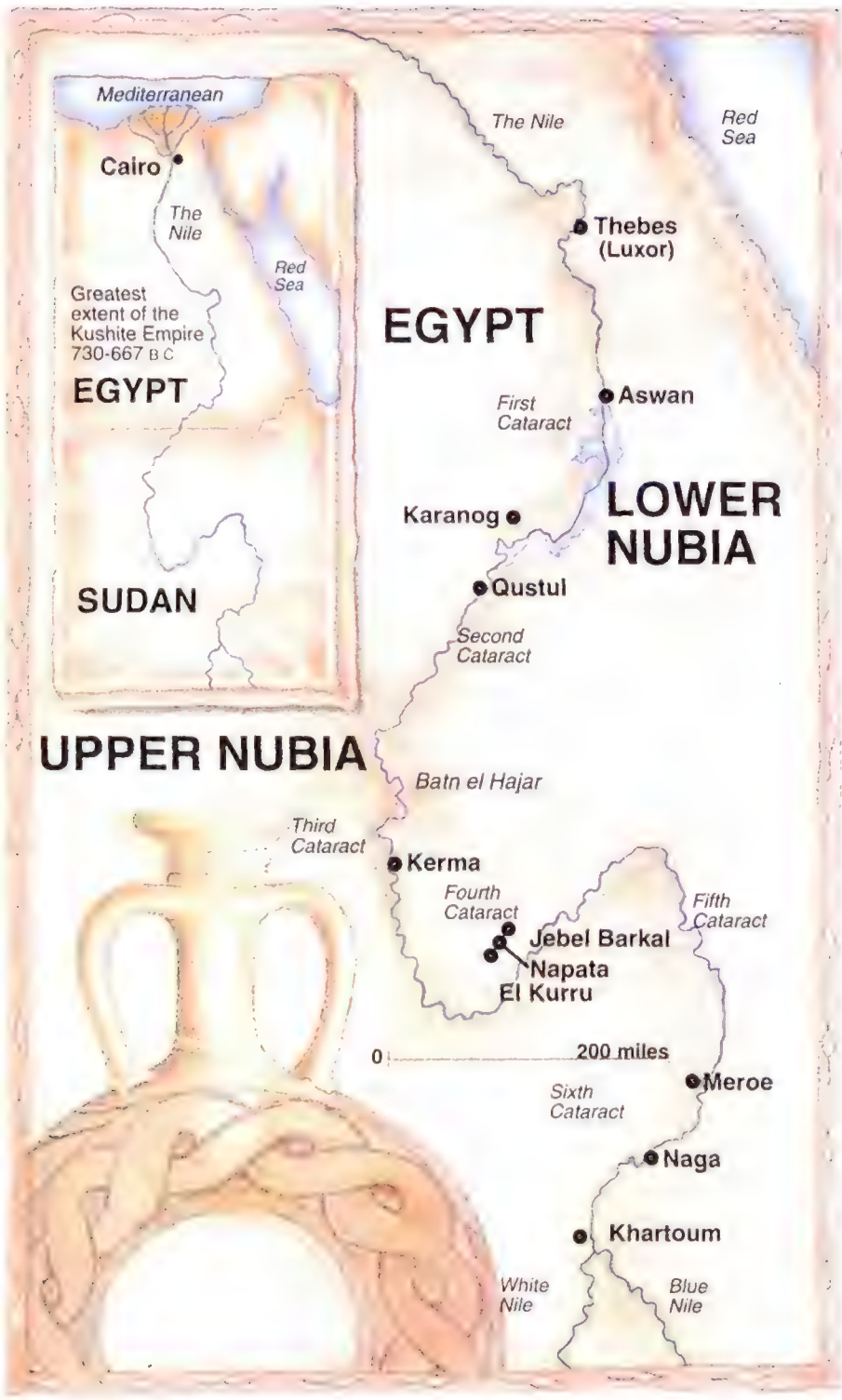
One reason is semantic. Over millennia, Nubia was known under many different names. To the early Egyptians, it was Ta-Seti or Yam or Wawat. Later it appears as Meroe. The Greeks and Romans called it Aethiopia (today's Ethiopia being Abyssinia to them). In the Bible it appears as Kush.

Another reason has to do with prejudice. Nubia has always been exceedingly remote and difficult of access. From its Christianization in the 6th century A.D. all the way down to the 19th, the kingdom vanished from the European record: only the glowing reports of the classical authors kept its memory alive. This neglect had everything to do with race—for Nubia had been an African empire, and a black African one at that. Even the Greeks perpetrated the prejudice. An early biographer of Alexander the Great records the queen of Nubia responding to an inquisitive letter from the youthful conqueror in the following words: "Do not despise us for the color of our skin. In our souls we are brighter than the whitest of your people."

The first archaeologists to document the glory that was Nubia succumbed to a kindred bias. Even as he dug the remarkable royal cemeteries of El Kurru below the Fourth Cataract, George A. Reisner, working for Harvard University and the Boston Museum of Fine Arts, concluded that the rulers whose tombs he unearthed must have been an offshoot of a dynasty of Libyan (thus,

Photographs by Enrico Ferorelli

Mohammad Saleh Baba, ghaffir (custodian) of royal tombs at Meroe (250 B.C.-A.D. 300), carries visitors' book.



Map of Lower and Upper Nubia displays image of a ring flask from a Meroitic grave, c. 1st/2d century B.C.

white-skinned) pharaohs. For decades, everything Nubian was regarded as derived from the Egyptian, hence "decadent" and "peripheral."

Only now, perhaps, is the Western world beginning to acknowledge the achievements of ancient Nubia, as signaled by four dazzling new exhibitions at major North American museums. At the Boston Museum of Fine Arts (MFA)–which, thanks to Reisner and his colleagues, owns one of the finest collections of Nubian treasures in the world–a permanent display opened in 1992. Another permanent installation was unveiled the year before at the Royal Ontario Museum in Toronto. Through September 1993, the Oriental Institute Museum in Chicago will host "Vanished Kingdoms of the Nile: The Rediscovery of Ancient Nubia." And at the University of Pennsylvania's Museum of Archaeology and Anthropology, "Ancient Nubia: Egypt's Rival in Africa" recently opened. After closing in Philadelphia in October 1993, the exhibition will travel to seven other museums around the country, through 1996.

The exhibitions have had strong attendance, particularly among African-Americans, many of them in school groups. And there's evidence that awareness of Nubia is seeping into the popular culture. A new comic-book character called "Heru: Son of Ausar," which was created by cartoonist Roger Barnes, is a Nubian hero. A rap

Kings of Kush adopted this burial custom circa 800 B.C.; their pyramids were steeper than those of the Egyptians.

band out of New York City calls itself Brand Nubian.

The surge of interest in Nubia did not arise in a vacuum. For the past 30 years, scholars in Europe and the United States have been piecing together a vivid but tantalizing picture of the neglected civilization. Yet it took the building of a dam to stimulate this new appraisal of ancient Nubia.

Reisner, the pioneer of Nubian archaeology, was an Egyptologist working on the lower Nile in 1906 when the Egyptian government decided to raise the dam at Aswan by 16.5 feet. Before the resultant flooding could drown forever many unexcavated sites, Reisner was invited to survey and dig upriver. Thus was launched what one scholar calls the "earliest program of extensive salvage archaeology" in the world.

Close on Reisner's heels came two British archaeologists working for the University of Pennsylvania, David Randall-MacIver and Leonard Woolley. The rich collections existing today in Boston and Philadelphia derive from the seminal fieldwork of these scholars. Yet so strong was the lingering condescension toward Nubia as a kind of second-rate Egypt, that as late as 1960 only one American scholar–Dows Dunham, Reisner's protégé and successor at the MFA–was working in Nubian studies.

In 1959 Egypt announced plans to build a huge new dam at Aswan. The waters of the Nile would create Lake Nasser, stretching 300 miles south to the Second Cataract, just across the border in the Sudan. UNESCO launched an all-out appeal to the archaeologists of the world, who responded with scores of energetic expeditions, sowing the seeds of our current understanding of ancient Nubia.

The disruption wrought by the dam was tragic. Nubians whose ancestors had lived along the middle Nile for as long as the oldest tales could testify gathered their belongings and made their exodus north to the planned villages that would replace their own. They kissed the graves of their ancestors; many filled their pockets with sand, their only keepsake of the lost homeland.

Losing one's way could mean losing one's life

On the face of it, Nubia seems an unlikely place for a major civilization to sprout. It lies in the middle of the hottest and driest area on Earth's surface; in much of Nubia, rain never falls. Farther north, in classical Egypt, the Nile creates a generous floodplain up to 15 miles wide, but in Nubia the fertile land bordering the river comes only in intermittent patches rarely exceeding 1,600 yards in width. The cataracts–canyons seamed with big rapids–as well as long, tormented passages such as Batn el Hajar, the "Belly of Rocks"–make continuous navigation up and down the Nile impossible. In the Sudan, where the river makes two great loops in the shape of an *S*, the ancient trade routes struck off on bold shortcuts across the empty desert. To lose one's way often meant to lose one's life. Even today, travel here remains as difficult and as dangerous as anywhere in Africa.

As Reisner plunged into this archaeologically pristine wilderness, where he worked tirelessly from 1907 to 1932, he slapped provisional names on the various cultures he began to identify. Unfortunately, these temporary labels have stuck. Thus we still allude to some Nubian cultures–each as complex and impressive as, say, that of the Hittites or the Etruscans–as the A-Group, the C-Group and the X-Group.

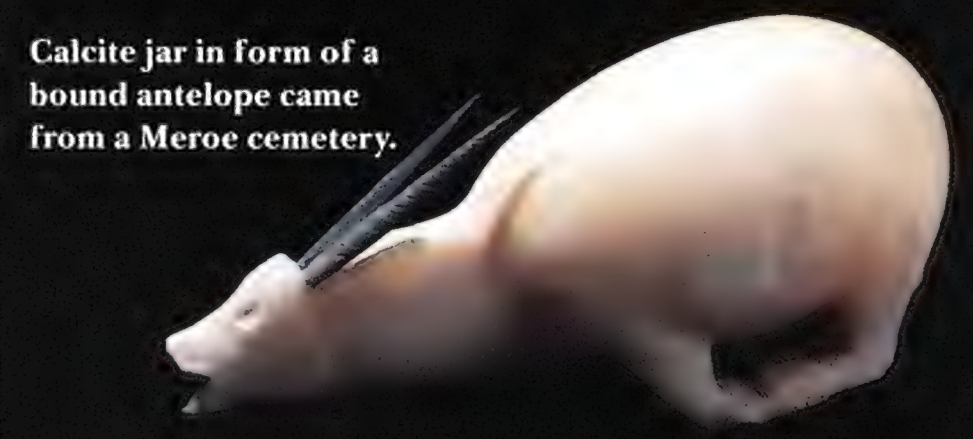
With the emergence of the A-Group around 3800 B.C., Nubia takes its place on the prehistoric stage. We still know relatively little about this early civilization, which became a serious rival to Pre-Dynastic Egypt. The A-Group's most distinctive artifact is a handsome "eggshell" pottery, named for its thin walls. Crisscross hatches and geometric patterns in red and cream seem to conjure up weaving; it is as if the potters were celebrating the discovery of the vessel that worked better than basketry.

Toward the end of its thousand-year sway, the A-Group emerges also in the written record, as the Egyptians invented their hieroglyphic script. The domain of the blacks in Lower Nubia was known in Egypt as Ta-Seti–the "Land of the Bow." Eventually the pharaohs waged war

Cylindrical shape, small opening, of decorated pot are typically Meroitic.

A sphinx with ram's head perches atop a column with colored-glass inlays.

Fired clay hippopotamus head may be Nubia's largest early sculpture, from A-group people (c. 2900 B.C.).



Calcite jar in form of a bound antelope came from a Meroe cemetery.

with Ta-Seti. A great victory around 2600 B.C. was won by the pharaoh Sneferu, who bragged that he took 7,000 Nubians and 200,000 domestic animals captive.

Bruce Williams of Chicago's Oriental Institute believes that the earliest definite evidence anywhere in the world of the institution of kingship may be among the A-Group of Nubia. Williams' argument hinges upon a handful of extraordinary objects found in royal A-Group graves. During my own visit to the Oriental Institute, Williams showed me a beautiful stone incense burner found at Qustul (just north of the Sudanese border), dated to around 3300 B.C. The cylindrical burner is encircled by a frieze of incised figures.

Peering through the display glass, I followed Williams' pointing finger. "The falcon means a god," he said. "That's definitely a representation of a king, and he's wearing a crown. The bound prisoner is going to be bashed in the head in front of the god. The burner is definitely a typical Nubian, not an Egyptian, object."

Other scholars, however, reject Williams' theory. Says David O'Connor of the University of Pennsylvania, "I think there may well have been an elite group in Nubia at the time, in charge of a complex chiefdom. But the objects Williams' argument depends on are almost certainly Egyptian, not Nubian—traded to Nubia in early pharaonic times. The kings he sees were Egyptian kings."

One of the most formidable obstacles to an appreciation of ancient Nubia is that, in terms of the written record, we learn about the civilization almost entirely in the words of its enemies—Egyptians above all, but also Hebrews, Assyrians, Persians and Romans. Thus, for the Egyptians, Nubia is always "vile," "miserable," "wretched." The pharaohs had images of Nubians carved on their footstools and on the bottoms of their sandals so that they could trample on their enemies daily.

The aggression of Egypt throughout the third millennium B.C. seems to have driven A-Group survivors south into the little-known lands above the Second Cataract. Around 2300 B.C., a pair of new cultures springs into view. One, appearing in Lower Nubia, was called by Reisner the C-Group. Elaborate tombs suggest these people were skilled pastoralists, raising huge herds of livestock and perhaps worshiping their gods through a cattle cult.

The C-Group kept peace with the kingdom to the north for centuries, during which time trade flourished and ideas flowed both ways. Then, in the 19th century B.C., the pharaohs turned belligerent again. Their motive may have been to control the gold mines that were being opened in the eastern desert. Thrusting above the Second Cataract, Egyptian armies built a series of colos-

David Roberts' latest book, Once They Moved Like the Wind: Cochise, Geronimo and the Apache Wars, *will be published by Simon & Schuster in July.*

Oriental Institute Museum; Museum of Fine Arts–Boston;
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sal fortresses along the tortuous Belly of Rocks. These fortresses were placed so that line-of-sight signals could be flashed from one to the next.

Meanwhile, 170 miles beyond the southernmost Egyptian fortress, the most powerful empire Nubia had yet seen was flourishing. Named the Kerma culture by Reisner, who in 1913 excavated tombs close to the modern town of that name, it was known to the Egyptians as the Kingdom of Kush. An ancillary motive for erecting the Egyptian fortresses, with their intensely defensive character, was no doubt fear of Kush.

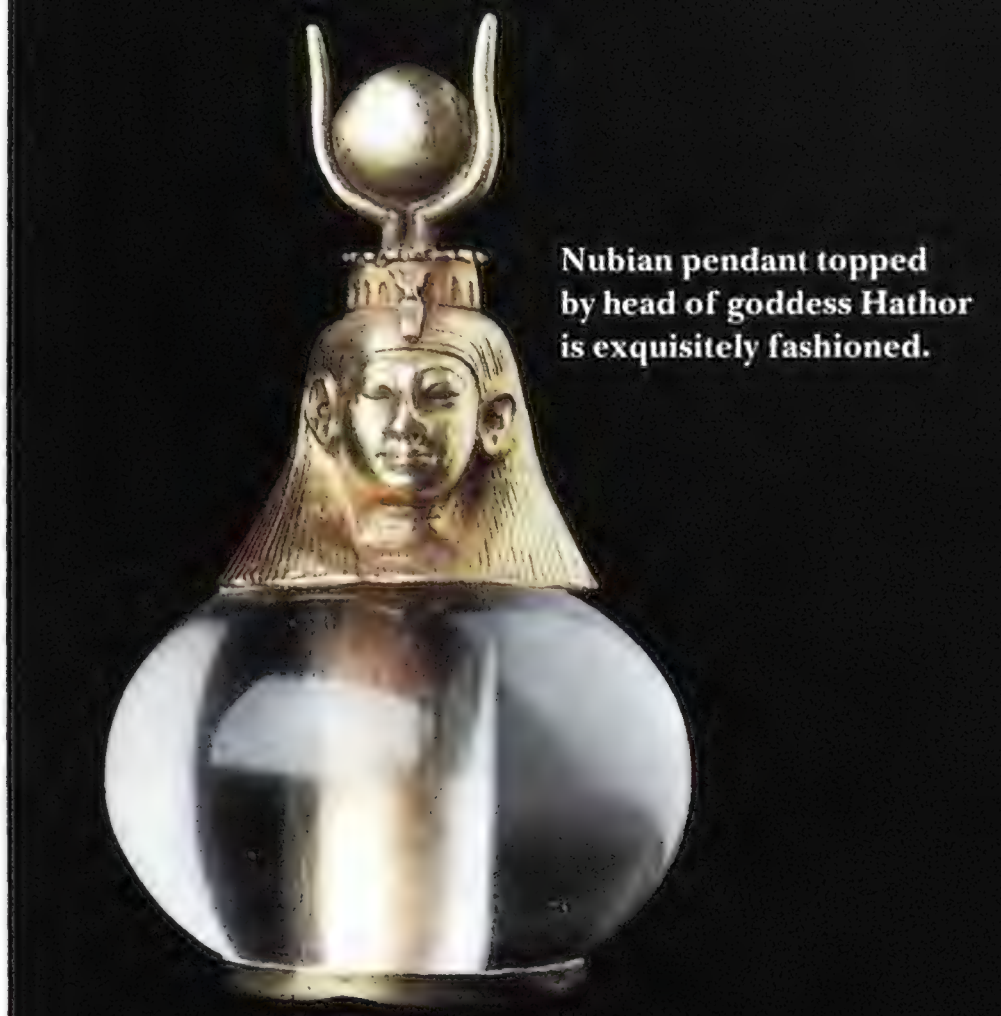
A flamboyant and grandiose glory

After 1700 B.C., racked by internal struggles, Egypt retreated from Nubia, abandoning its fortresses along the Belly of Rocks. In the void, Kerma grew magnificently. Nothing declares the flamboyant, even grandiose glory of Kerma more forcefully than its royal tombs. The king was buried under a huge tumulus—a circular mound—with the diameter nearly the length of a football field. He was laid on a gold-covered bed, and the finest objects wrought of gold, bronze, ivory and faience were placed beside him. Into the tomb's central corridor crowded a host of followers and concubines (400 of them in one king's tomb), who, dressed in their best clothes, came willingly to be buried alive in honor of their master.

All through Nubia, from Reisner until the present day, burial sites have monopolized archaeologists' attention. This has been true in part because the remains of habitation sites are so hard to find; houses were made of perishable stuff, but tombs were built to last. Only two large villages from the C-Group, for instance, have ever been excavated. Consequently we know much more about the rulers of Nubia than about the commoners.

At Kerma, however, for the past 28 years an international team under Charles Bonnet, of the University of Geneva, has carried out one of the most ambitious digs in Africa. In the process, they have revealed not only the palaces and cemeteries but the main town of Kerma. When I visited Bonnet in Geneva last fall, he showed me the plan of the settlement. Tapping an outlying area with his pencil, he said, "Just last year we found a whole new section of houses here. It goes on and on!" Bonnet's work documents the oldest city that has ever been found in Africa outside Egypt.

Many of the houses Bonnet's team excavated were rectangles of mud bricks, but the most characteristic domicile was a circular hut made of wood (always a rare substance along the Nile), topped with a thatched roof. Each hut was ingeniously designed to allow the prevailing north wind to blow through it during the desperate heat of summer; in winter, a temporary wall blocked the same breeze. Small neighborhoods of huts were bordered by fields and gardens where crops (chiefly wheat



Nubian pendant topped by head of goddess Hathor is exquisitely fashioned.

Winged goddess on a gold pectoral, from a 6th-century B.C. king's tomb, probably represents the goddess Isis.

This bronze bed leg with watchful goose is from El Kurru (7th century B.C.).

Incised horns of finely worked ram's-head earring were crafted separately.

Museum of Fine Arts–Boston

Royal ceremonies were held in the kiosk, near a temple in southern town of Naga on caravan routes to the Red Sea. Hence, as a center of commerce, it drew on architectural elements from both the Greeks and the Romans.

and barley) were raised, and cattle and goats pastured. No general plan governed the shape of the sprawling city, but a defensive palisade surrounded it.

Once more the tides of empire shifted. Around 1550 B.C., a newly invigorated Egypt invaded Nubia. The struggle against Kerma lasted 100 years, but at last the pharaohs conquered all but the southernmost reaches of Nubia. Their sway lasted another 350 years, during which the Nubian upper class became thoroughly Egyptianized, decorating their tombs with images of workers on date palm plantations and with performing dancers and musicians.

But the tides shifted again. At the end of the New Kingdom, about 1080 B.C., Egypt was torn by conflict between the pharaohs and the priesthood. The country began to fragment into city states, among them several in Nubia that became all but autonomous. What happened after 1080 remains a great mystery.

According to Timothy Kendall of the MFA, "the greatest gap in our knowledge of ancient Nubia is the period from 1000 to 850 B.C. We know almost nothing about it. Only one or two sites in Nubia can be dated to this period, and then, only to the latter part of it. Some experts believe Nubia was growing stronger and politically independent; others think that Egyptian enclaves and temple estates persisted. But these are theories spun out of thin air. Nobody really has a clue, except that a series of elaborate tombs began to be built in 850 B.C."

When Nubia emerged from this historical void in the eighth century B.C., it did so dramatically, achieving the greatest triumph in all its long history. By this time the center of power lay at Napata, which was just below the Fourth Cataract. Here a holy mountain called Jebel Barkal was believed to be the home of the ram-headed god Amun, who spoke oracles through statues and even selected the country's rulers.

Whatever their motive, after 750 B.C. the Napatan kings pushed boldly north. Around 730, a great army under a king named Piye conquered all of Egypt. He and his successors became the pharaohs of the 25th Dynasty, the later kings moving from Napata to Memphis to govern. The Nubian empire now stretched all the way from the junction of the Blue and White Niles to the delta (present-day Alexandria)–1,200 miles as the crow flies.

Although the inscribed victory stela Piye erected to proclaim his triumph alludes to him in Egyptian hieroglyphs as "raging like a panther" and bursting upon his enemies "like a cloudburst," the Nubian pharaohs of the 25th Dynasty ruled with an enlightened benevolence. They were Medicis, rather than Caesars, who awoke Egypt to the artistic and cultural splendor of its own past as they patronized artists, revived lost learning and rebuilt derelict temples.

Piye was also a great lover of horses, the first of four successive pharaohs to have whole chariot teams buried near his grave. The horses, interred in a standing position, were decked with bead nets and brilliant jewelry. When Piye conquered Hermopolis, the defeated King Nemlot opened his harem. But Piye averted his eyes from the women and demanded to see the king's horses instead. These he found nearly starved to death. "That my horses were made to hunger," he thundered at Nemlot (as recorded on Piye's stela), "pains me more than any other crime you committed in your recklessness. Do you not know God's shadow is above me?"

The brilliance of the Napatan empire speaks in many of the objects now on display in Boston, Philadelphia, Chicago and Toronto. In the MFA, I gazed at haunting rows of *shawabtis*, part of a cache of 1,070 found in the tomb of King Taharqo, Piye's son. Figurines carved out of alabaster and gray or black granite, ranging from seven inches to two feet in height, these sober-looking humans with arms crossed were "answerers" who would perform for the deceased king the work the gods com-

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manded of him. (Here, I thought, was a humane alternative to the retainers buried alive at Kerma!)

One of the most exquisite objects ever recovered from Nubia is also on display in Boston. It is a small pendant from the tomb of one of Piye's wives, a gold head of Hathor, goddess of beauty, mounted on a ball of rock crystal, thought to have magical properties.

The Napatan supremacy was short-lived. By 667 B.C. the Nubian pharaohs had abandoned Egypt to another raging panther, King Esarhaddon of Assyria. Once again, we learn of a profoundly pivotal moment in Nubian history only in the contemptuous boasts of its enemies: "I tore up the root of Kush," crowed Esarhaddon, "and not one therein escaped to submit to me."

Gradually through the next four centuries, the Nubian political and cultural center shifted south beyond the Fourth Cataract. In isolation and relative obscurity, the last Nubian empire evolved. Its center was the town of Meroe, halfway between the Fifth Cataract and the junction with the Blue Nile.

Meroe, which flourished from about 270 B.C. to A.D. 350, is in many respects the most intriguing of all the incarnations of Nubian greatness. Cambyses of the Persians, as well as Petronius among the Romans, sent out armies to conquer the distant country, without success. Even Nero contemplated the possibility of an attack. Despite all this contact, the veil of mystery that clung to the legendary southern land never really lifted.

One reason was linguistic. In their isolation from Egypt, the Meroites lost the use of Egyptian hieroglyphs. By 170 B.C. they had developed their own written language, a quasi-cursive script now called Meroitic. Stelae and plaques covered with this writing abound. By 1909 scholars had proved that it was an alphabetic script (unlike the hieroglyphs, which are part ideographic, part phonetic and part alphabetic). Thanks to a few parallel inscriptions, they had learned the sound values for each of the 23 Meroitic letters. Yet more than eight decades later, the language remains undeciphered.

At first, scholars were confident that Meroitic would turn out to be a cognate of the Nubian tongues spoken today along the Nile. That hope faded, and all that the experts can now assert is that Meroitic seems to be related to no other known language. Decipherment must await the discovery of a Nubian Rosetta Stone—a stela with lengthy parallel texts in Meroitic and Egyptian or Meroitic and Greek.

Dr. Charles Bonnet

Horns surrounding royal tomb, Kerma (1800-1600 B.C.), are from skulls of cattle killed to feed mourners.

A royal offering to Amun

In the MFA, I walked around and around a five-foot-tall stela found at Jebel Barkal; covered on all sides with writing, the stone bears the longest known inscription in Meroitic. We know the text has something to do with an offering by King Tanyidamani to the god Amun, and we can see places where lines have been deliberately erased. The rest is enigma.

Timothy Kendall tantalized me further by describing the second-longest Meroitic inscription known, found on a stela now in the British Museum. "If we could read it," he sighed, "we'd have the Meroitic version of the war against Petronius and the Romans in 24 B.C."

In its drift away from Egyptian culture over the centuries, Meroitic art developed its own idiosyncratic genius. At the Oriental Institute, Emily Teeter explained to me its quirks. "It becomes a very spontaneous art, full of free-flowing improvisation," she said, pausing before a Meroitic pot. "You see that?" She pointed to a curling snake painted on the vessel, holding in its mouth a drooping flower. "The flower is obviously an *ankh*."

I gasped in sudden recognition. I had seen many an *ankh* on Egyptian objects: a cross-shaped symbol topped with an oval, which is the hieroglyph for the verb "to live." In Egyptian art, the *ankh* appears alone or in rows of declarative rigidity. On the Meroitic pot, the snake stings the world to life with a flower. "The Egyptians are too staid for this," Teeter said. "They don't like loopy things."

At the University of Pennsylvania museum, David O'Connor guided me through several hundred Meroitic objects from the provincial capital of Karanog, excavated by MacIver and Woolley in 1907-08. The same freedom—a set of wild variations on Egyptian themes—graced these priceless objects. In Egypt, O'Connor explained, the *ba* statue, which represents a dead person's spirit, is a formal-looking bird with a human head; in Meroe, the *ba* becomes a human with wings. The pots dance with two-legged crocodiles, with giraffes ranging from the lordly to the comic, with deer darting through

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Lively figures decorate granite Meroitic stela, with its tantalizing but undecipherable inscription.

shadows. There are abstract designs made of endless waves of draped festoons and floral curlicues.

The sheer exuberance of Meroitic art proclaims a civilization that believed in pleasure and playfulness. The pots were largely used for wine drinking. At certain Meroitic sites, whole barrooms have been excavated.

At the end of the fourth century A.D., Meroe declined. The distinctive script fell out of use, and no new temples were built. It has long been the fashion to regard the 250-year interim before Christianity, whose culture Reisner called the X-Group, as a Nubian Dark Age; but recent scholars point to the continued excellence of pottery and jewelry, to a flowering of brilliant work in bronze and iron, as well as to the magnificent royal tombs at Ballana and Qustul, as signs of a healthy culture, original in its own right.

Although the Meroitic language seems to have been lost forever, scholars who travel in the Sudan have been struck by the remarkable survival in living cultures of traits and belongings they know also from archaeology. The wood-and-palm-fiber bed a Sudanese sleeps on today looks very much like ones found in royal tombs in Kerma. The throwstick, a proto-boomerang still used for hunting today, is identical to ones retrieved by Reisner from a Kerma tomb. Even current Sudanese fashions in hairstyle and facial scarification find their counterparts in ancient paintings of Nubians.

Thus the discipline of ethnoarchaeology, still in its infancy, may yield new insights into Nubia, as scholars ask living informants to comment on ancient relics. Emily Teeter told me of a pair of small revelations. Shortly after the Oriental Institute's exhibition opened, she met Awad Abdel Gadir, a Sudanese teaching in Texas. He took her aside, pointed to a stone object and said politely, "That's not an incense burner. We have those in our village. It's a receptacle for a liquid offering." Teeter changed the label. He paused before a "thorn-removal kit" from the X-Group–a kind of Swiss Army Knife of iron tools on a chain, including tweezers, picks and scrapers. "I remember," said Abdel Gadir, "my grandmother used to wear a set like that on her belt."

Meanwhile, the archaeological surface of ancient Nubia has barely been scratched. The sites that lie in lower Nubia, north of the Egypt-Sudan border, are gone forever, swallowed by Lake Nasser. In the Sudan, the 1989 coup that brought Islamic fundamentalists to power, as well as the civil war that continues to rage in the country's south, have made it harder than ever for Western archaeologists to work there.

Yet, in the Sudan, a French survey has counted one million ancient mounds, only a fraction of which have been excavated. There are more royal pyramids in the Sudan than in all of Egypt. I asked Timothy Kendall, who has done breakthrough work at Jebel Barkal, where he would dig if he had carte blanche to choose among the Sudan's best Nubian sites.

He leaned back in his chair, put his hands behind his head and smiled. "I'd go to Naga," he said, "although it's just a pipe dream, because the Sudanese Antiquities Service is saving it for themselves."

I knew Naga as a Meroitic site that, uncharacteristically, lay inland in the Butana Desert, some 25 miles south of the Nile. "Why Naga?"

"It's a complete Meroitic city founded about the first century A.D., with important temples, a settlement and a cemetery," Kendall answered. "The residents built an artificial reservoir of water. Not a single spadeful of earth has ever been turned there.

"Of course," he added, gazing off into space at the eternal dilemma that bedevils archaeologists, "you'd need a lot of money, a big team, a lot of cooperation, extreme physical endurance." He paused. "And a very, very long life."

Sudanese Mohammed Selik, who lives near Jebel Barkal, reflects the pride and dignity of the modern Nubian.

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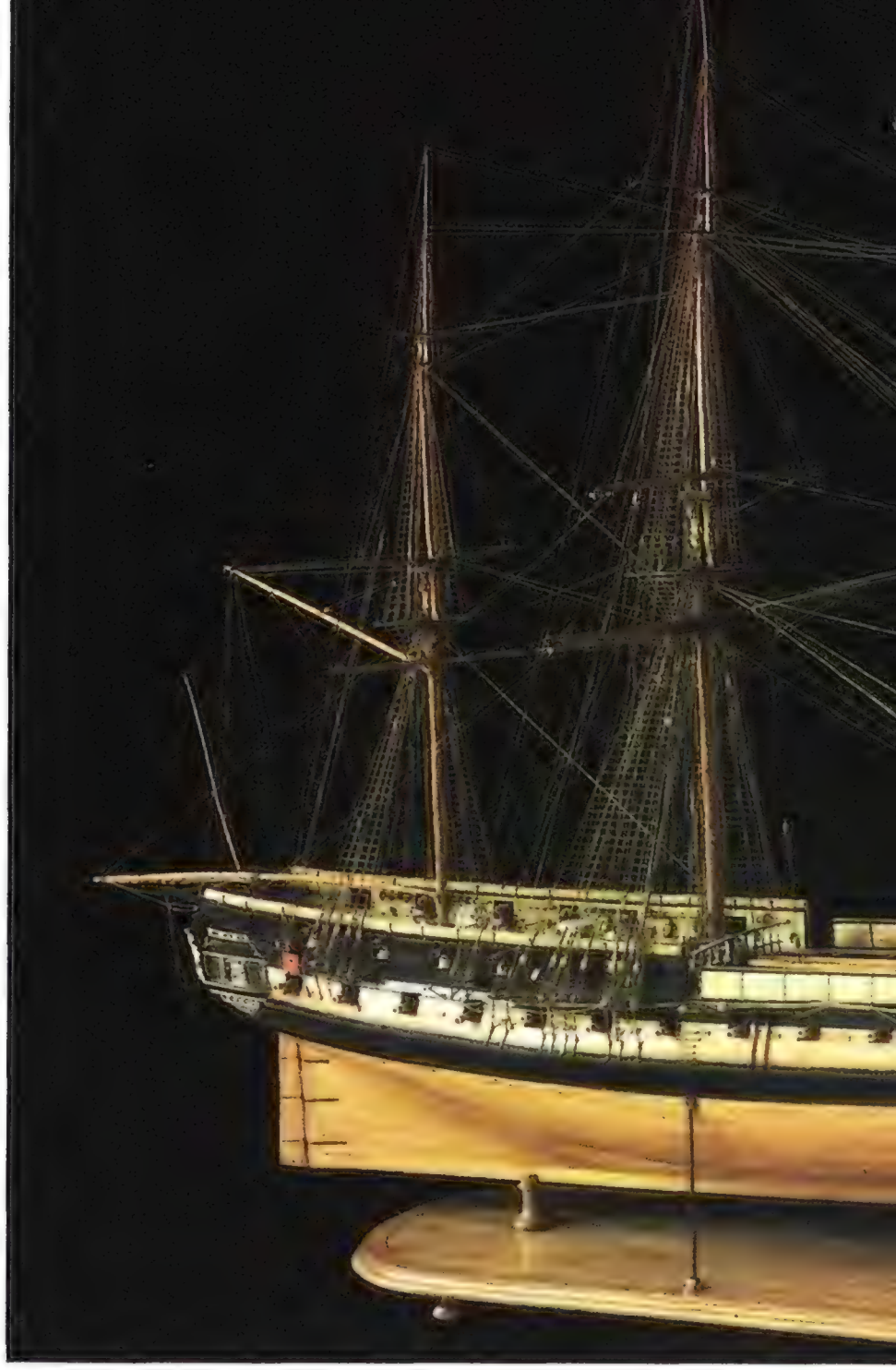
A Naval Academy gathering of mini men-of-war

A fine fleet—of meticulously detailed and crafted ship models from the age of sail—has found a permanent berth at Annapolis

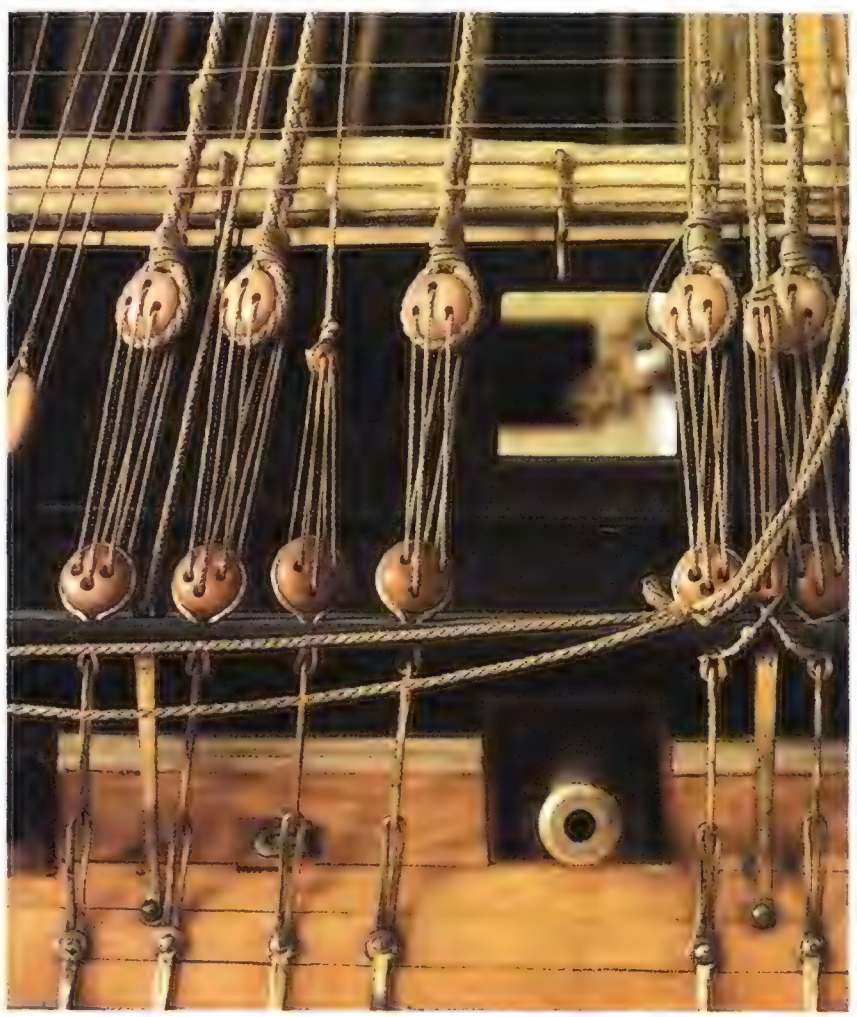
A splendid fleet of square-rigged ships is now moored at the U.S. Naval Academy in Annapolis, Maryland. The vessels lie at anchorage in a basement gallery in Preble Hall, the Academy museum. These warships are only about a yard long. They constitute one of the finest ship model collections in the world.

The little vessels, covering nearly two centuries, from the mid-1600s to the 1830s, are mostly "dockyard models," built along with their originals in the dockyards of England, and scaled at one-quarter inch to a foot. They were painstakingly crafted to record for the benefit of the British Admiralty new quirks of design and construction, inventions and modifications that might affect seaworthiness or ship handling. Most were collected and given to the Academy in 1935 by an industrialist, Col. Henry H. Rogers. Now, with a gift from the Class of 1951, they have been gathered together from various Academy buildings, refurbished and put on permanent exhibit.

In their lighted cases—many of them antique—the ships flaunt elegantly decorated sterns and point their long bowsprits like admonitory fingers above ornate symbolic figureheads. Though the joy of miniatures lies in extraordinary details and precise workmanship, anyone who has been drawn into naval history will be stopped near the entrance to the gallery by a model of the 38-gun British frigate *Shannon*. She's mounted on the same polished wooden base that held her when she was given to Philip Broke, captain of the real *Shannon* in the War of 1812. Grant Walker, an Army major who has taught naval history at the Academy, says that some mod-



British frigate HMS *Shannon*, 38 guns, destroyed the USS *Chesapeake* in a ship duel off Boston in 1813.



Amidships, model has sailors' hammocks lashed to gunwales as protection from flying splinters.

els were built as presentations to the actual ship's captain. This is one.

Early in the war, Britain lost three frigates in a row to the USS *Constitution* and her sister ships of the fledgling American Navy. But then the British blockade began to tighten, and the *Shannon* showed up off Boston Harbor and challenged the American frigate *Chesapeake* to come out and fight. The American captain, James Lawrence, never received the challenge, but he was headed out anyway, eager for a showdown despite his raw crew.

His British adversary had the well-deserved reputation of being a nut about accurate gunnery. The *Shannon* shattered the *Chesapeake,* mortally wounding her captain. As Lawrence was carried below, he gasped, "Tell the men to fire faster and not to give up the ship"–words that were shortened to "Don't give up the ship" and sewn into a blue battle flag later flown by Lawrence's friend Oliver Hazard Perry at the Battle of Lake Erie. It now hangs in Memorial Hall at the Naval Academy.

The *Shannon*'s model shows her guns poking from their ports on the gun deck, her stubby carronades on the quarterdeck, ready for action. Amidships is a white line of bundled canvas along the gunwales. These are the crew's tight-packed hammocks, stowed in netting to form some protection during battle.

That kind of detail suddenly endows the model with life. Imagination takes over, manning that breastwork of hammocks with red-coated marines firing at the American quarterdeck. The bundled canvas shelters them from savage splinters shrieking through the air as 24- and 32-pound shot smashes into solid oak.

You can almost hear the sounds and smell the lighted matches in the linstocks held ready to set off the next crashing broadside. And you need no miniature human figures to sense the shocked silence as the American colors are struck, the thunder ceases and the British crew–barefoot men in bloodstained striped jerseys–unlash great timbers from the spar deck to repair the *Shannon*'s heavy damage.

For Americans, the most famous ship represented here is John Paul Jones' *Bonhomme Richard.* Her model was done by a modern craftsman, Robert W. Cook of Nova Scotia. Since the original ship was a French merchant vessel, the *Duc de Duras* of 1765, later converted for war by Jones, Cook presents both phases of her existence in a single model. The port side is a cargo ship, the starboard, Jones' *Bonhomme Richard,* refitted and beefed up in 1779 with 20 guns to a side, ready to fight the heav-

Cannon (opposite) pokes muzzle through *Shannon*'s gunport. Above it, blocks, called deadeyes, provide mechanical advantage in tightening the shrouds that support masts. Female figure (left) is on ship's stern.

Photographs by Henry Groskinsky

Model (c. 1800) shows off a copper bottom meant to frustrate attacks by wood-eating marine worms.

A 70-gun ship-of-the-line, this is a rare example of a pull-apart model that lets people see into interior.

ier-gunned HMS *Serapis*, off Flamborough Head in the North Sea, in what was to become one of the most famous battles in American naval history.

Soon after the first exchange of broadsides came the legendary moment when Jones, seeking always to sail "in harm's way," supposedly answered the British captain Richard Pearson's shouted demand to surrender by shouting back, "I have not yet begun to fight!"

While British crowds watched the battle from the cliffs and headlands nearby, Jones fought his creaky old vessel to her death, but not before the *Serapis* had struck her colors, and Jones had got his crew aboard the captured British vessel. When Pearson was knighted by King George III after the battle, Jones quipped, "Let him fight me again and I'll make him an earl."

The exhibition was put together under the direction of naval historian Kenneth Hagan, Naval Academy museum director. The earliest ship model in it dates from about 1650, just after England's terrible civil war. Charles I had lately been beheaded, and Oliver Cromwell's austere Commonwealth established. Curator Robert Sumrall, a big, soft-spoken naval architect and former battleship chief petty officer, points out small differences between this sparely decorated ship and the next model, built in 1679, whose carved details are more floral, more joyous–a sure sign to experts that it was built during the Restoration of Charles II, when fun was no longer frowned upon in England.

"This model is the *Grafton*," says Sumrall. "And we think Samuel Pepys may have owned it." The irrepressible diarist, Secretary to the Admiralty in the 1670s and '80s, mentions just such a model in *The Tangier Papers* of 1684.

Most dockyard models lacked rigging because they were built for sailors. "Any sailor back then," says Sumrall, "knew how every kind of rigging looked as well as we know how tires look on cars." The earlier miniatures also generally showed only bare ribs below their water lines. For it was the gun decks and quarterdeck, the forecastle, the shape of the bow, the great stern cabin with galleries and embellishments, that mattered to authorities.

Dockyard models were not usually signed, but clues

During 17th century, decoration on warships often included individually carved wreaths around gunports.

It shows structural details of main and lower decks, with the capstans used to haul up anchors and sails.

Ornate taffrail of 100-gun ship *Britannia* was topped by a carving of two warriors on horseback.

and hints help identify a few builders by name. A 1634 autobiography by the famed shipwright Phineas Pett describes a "model for the great new 110-gun ship." Researchers learned that this model was carved by Peter Pett under the watchful eye of his father, Phineas. Pepys' entry for December 30, 1663, written 29 years later, refers to a gift model ("indeed it is a pretty one") wrought by "Mr Chr' Pett," which sounds as though Christopher Pett was a third-generation model carver.

In 1992 a Naval Academy volunteer found a note folded on the keelson (the top of the keel) inside the model of a 36-gun frigate thought to be HMS *Perseverance.* It read, "Sheerness. 25 October 1820, the frigate *Inconstant,* 36 guns, made by Geo. Stockwell, son of Geo. Stockwell, Moddler. Son Mark 14 months." The model was rechristened the *Inconstant.*

Upbeat design on bulwark of pull-apart model has fanciful dolphins, knight with St. George shield, sword.

Model makers used special tools and sometimes worked with magnifying glasses to achieve minute accuracy of detail. They used fruit tree woods or boxwood, which is hard but peels away cleanly under a carver's knife. They often used ivory for tiny fittings: blocks, bitts, belaying pins, as small as one-eighth of an inch. When they rigged a model it was generally with silk.

One modeler's oddity is a fire ship displayed in an early 18th-century case. Its gunports are not hinged at the top but at the bottom, so they drop down, helping create a draft to keep the flames roaring as, crammed with a mixture of gunpowder, saltpeter, resin, sulfur and linseed oil, it drifted onto an enemy fleet or battle line. Fire ship crews towed a couple of small boats astern so they could escape.

Dockyard models were built from the keel up, deck upon deck, and some cutaways allow a glimpse belowdecks. But the insides of a fully planked and decked model like the *Princess Royal,* a 90-gun warship built in 1773, were permanently sealed off from view. At least until the Academy arranged for orthopedist Stephen Faust to see them. Dr. Faust's instruments–usually used to look inside a football player's knee–light up hidden areas and transmit views electronically to a monitor.

At the touch of a button, the operator produces a pho-

Bill Hahn

Interior of *Princess Royal*, as seen by laparoscope, shows details not seen since the model was made in 1773.

Maj. Grant Walker and Dr. Stephen Faust join forces to produce digital optic view of model ship's insides.

tograph, and the resulting belowdecks images from models often look a bit like the underwater views of the insides of sunken wrecks. They are surprising. Though never meant to be seen by the human eye after the model's completion, the *Princess Royal*'s insides are carefully wrought. Her gun deck, as on all men-of-war, is painted bright red to lessen the shock of seeing blood during battle. Tiny ringbolts appear inboard of the gunports, where heavy breaching lines reined in the kick of the cannon. The handles of a pump (1/2 inch by 1 inch) appear ready for cranking the bilge dry.

Only modern fiber-optic or, more often nowadays, liquid-light instruments can reveal these details. If medieval cathedrals had carvings on the unexposed sides of statues, for the eyes of God alone, the same could almost be said of these beautifully crafted vessels.

Craftsmanship becomes even more awesome in an adjoining, unlighted section of the gallery, where a dozen models gleam ghostly white in their darkened cases. They were fashioned from bones by French prisoners of war. The carvers were Napoleon's sailors, taken by Britain's navy and stuck for years in rat-infested hulks or ashore in prisons like the notorious Dartmoor.

Unlike the British, the French did not rely on press gangs to provide crews for fighting ships. Instead they used conscription, sometimes picking up tradesmen and craftsmen from inland cities and villages along with veteran seamen from the coast. "When a craftsman was captured by the British and imprisoned," says Sumrall, "he fell back on what he knew to keep from going mad."

The prisoners built models of their ships from memory and found they could sell them to their wardens. So, though most of these ghost ships are French, they fly little Union Jacks for luring British buyers. British captors saved steak bones from their own meals and tossed them into the French cells. They let the prisoners fashion tiny knives and chisels from bits of metal and shards of glass. Beautiful white ships gradually took shape, planked with thin, curved strips of bone. Soon English civilians began buying them and commissioned the prisoners for more. Business boomed.

"Apparently, there were cases when a man was freed but wouldn't leave his cell until he'd finished his ship," says Sumrall. Some prisoners were allowed to stay on in England after the wars ended, to work at this new trade. Many married Englishwomen and raised families.

Though the bone models are not to scale, they're built with such care that all is forgiven. White, delicate, jewel-like, they fetch $15,000 to $20,000 today. The finest of them all stands at the top of a stairway leading down to the ship model gallery. She's Nelson's flagship, HMS *Victory*, done in bone and ivory. French POWs at Dartmoor were commissioned to build her soon after Nelson's death at Trafalgar in 1805. This time they were given drawings of the famous old vessel to work from, so this *Victory* is quite accurate. She was given to the British royal family, who placed her above Nelson's tomb at St. Paul's Cathedral. There she rode quietly at anchor until World War I, when she was sold to raise money for Royal Navy relief. Now here she is, not exactly at home, but at least back in the bosom of another–and these days friendly–navy whose inclination to sail "in harm's way" is in the best Nelsonian tradition. The *Victory* herself, on which Nelson died during the Battle of Trafalgar, may still be seen in Portsmouth, England, where, like her contemporary, the USS *Constitution* up in Boston, she is still a commissioned ship in her country's navy.

Intricately rigged ship was carved from beef bones by Napoleon's sailors in British prisons, then sold to captors. Created from memory, "bone ships" were usually French, flew the British flag to please clients.

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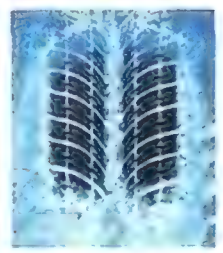

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By Matt Ridley

A boy or a girl: Is it possible to load the dice?

Insects and other creatures 'choose' the sex of their offspring. Humans may soon learn to do it consciously. If we do, what then?

New Zealand women and Venezuelan opossums would not appear to have many similarities. But there is one. Both fit the predictions of an evolutionary theory devised 20 years ago by biologist Robert Trivers and mathematician Dan Willard: they seem capable of unconsciously selecting the sex of their offspring. One of evolutionary biology's more influential and yet more puzzling ideas is leading inexorably to some unexpected conclusions about us humans.

The possibility that humans, consciously or otherwise, can biologically determine the sex of their children raises all sorts of questions, including ethical ones. But the first question has to be whether in fact they do. Several lines of evidence indicate that humans do choose, just as many other animal species do. The case is not yet, however, airtight. "Almost everyone I know who investigates this subject regrets it," says one researcher. "It's frustratingly hard to get clear-cut results."

Almost no subject is more steeped in myth and lore than the business of choosing the sex of children. Aristotle and the Talmud both recommended placing the bed on a north-south axis for those wanting boys. Anaxagoras' belief that lying on the right side (considered the superior side) during sex would produce a boy (considered the superior sex) was so influential that centuries later some French aristocrats had their left testicles amputated. Modern recipes, from French diets designed to produce boys to Japanese calcium pills to supposedly scientific gender clinics, are all notably bereft of any statistical proof that their methods work. It is a field that draws

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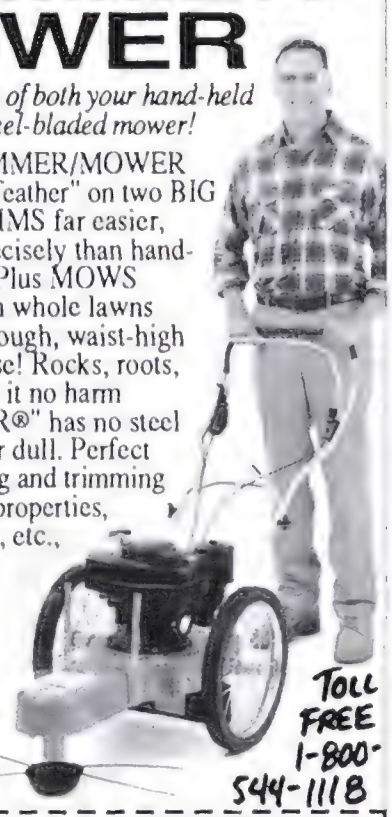

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charlatans like a carcass draws blowflies.

Bart Gledhill, of the Lawrence Livermore National Laboratory, where researchers are at work on the human genome project, is emphatic on the subject. He says flatly, "The only sure way to be certain of having a boy is, sadly, female infanticide or amniocentesis followed by abortion if it is a girl." Those repugnant practices are undoubtedly on offer in various parts of the world. In some age groups in China, there are five boys for every girl, largely the result of the infanticide of girls during the past two decades, induced by harshly enforced one-child-only policies. In a 1988 study of 8,000 abortions done at clinics throughout India, 7,997 were of female fetuses.

Nonetheless, there is growing evidence that some animals can unconsciously bias the sex of their offspring, and some tantalizing hints that humanity may be among them. We human beings are accustomed to the notion that our gender is determined at conception by pure luck. If the first sperm to penetrate your mother's egg carried a Y chromosome, you are a male; if it carried an X chromosome, you are a female. Because men produce X- and Y-carrying sperm in equal numbers, it seems to be a matter of pure chance.

But it is not. Several well-established factors bias the sex ratio of human offspring. Most famous is the "returning soldier effect": during and immediately after major wars, more sons than usual are born. Occupation can have an effect: male abalone divers, fighter pilots and anesthetists have more girls than boys. Older fathers are more likely to have girls, but older mothers are more likely to have boys, and so on.

If we were insects, or even fish, none of this would come as a surprise. Among bees and wasps, the mother controls whether her eggs will develop into males or females simply by choosing whether to fertilize them. Unfertilized eggs become male, fertilized ones

Matt Ridley is finishing a book, The Red Queen: Sex and the Evolution of Human Behavior, *to appear in 1994.*

The queen determines the sex of bees by deciding which eggs to fertilize.

female. In many reptiles gender is determined by the temperature at which the eggs are incubated. Warmer alligator eggs develop into males, cooler ones into females. The opposite occurs with many turtles.

Some fish go even further and change their own sex halfway through their lives: a female becomes male when large enough to defend a harem of females. It all has to do with the elemental biological drive to leave as many offspring as possible, to have one's genes live on into the future. Sex change makes good sense from a fish's point of view, because there is a basic difference between the risks and rewards of being male or female. A large female fish can lay only a few more eggs than a small one, but a large male fish, by fighting for and winning a harem, can have a great many more offspring than a small male. Conversely, a small male does worse than a small female because he fails to win a mate at all. Therefore, the following strategy often appears among polygamists: if small, be female; if large, be male.

The Trivers-Willard hypothesis says

that this general principle applies even to those creatures that cannot change sex but do take care of young. Think of it as a competition to have the most grandchildren. If males are polygamous, a son in good condition can physically exclude other males from breeding and inseminate more females, thus giving you far more grandchildren than his equally fit sister. But a son in poor condition will do worse than his sister because he will probably fail to win any females at all.

Therefore, said Trivers and Willard, parents in good condition—who will produce strong, healthy offspring likely to succeed—"should" have male young; parents in poor condition "should" have female young.

When first offered, the conjecture was scoffed at as farfetched and fanciful. Over the intervening years, however, research has begun to lend it support. The most impressive data was collected by researchers Steve Austad and Mel Sunquist, who actually were trying to disprove the theory. They trapped and put radio collars on 40 virgin female opossums in their burrows in Venezuela. They fed 20 of them sardines every other day; the sardine-fed animals raised nearly 1.4 times as many males as females, while the others raised young in a ratio of 1:1.

Opossums are not alone. Hamsters reared in the lab can be made to have female-biased litters by keeping them hungry during adolescence or pregnancy. Among nutria, females in good condition give birth to male-biased litters; those in poor condition produce female-biased litters. White-tailed deer yearlings, not yet grown to full strength themselves, have female fawns more often than by chance. So do wood rats under conditions of stress. The most intriguing results, however, were those that concerned social status rather than physical condition. Tim Clutton-Brock of the University of Cambridge studied red deer on the island of Rhum, off the coast of Scotland. He found that the mother's condition had little effect on the sex of her calves, but her rank within the social group did matter. Dominant females were slightly more likely to produce males than females.

In some fish, females will turn male when given chance to acquire a harem.

Clutton-Brock's results alerted primatologists, who for some time had been documenting biased sex ratios in various species of monkeys. In the Pe-

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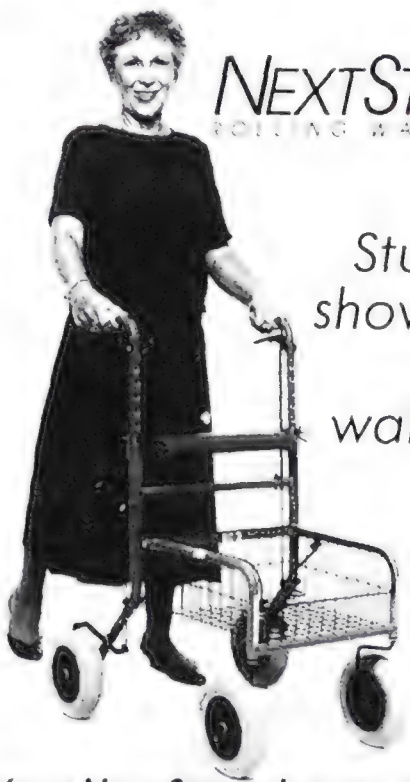

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ruvian spider monkeys studied by Meg Symington, now with the World Wildlife Fund, there was a clear association between rank and sex of offspring. Of 21 babies born to the lowest-ranked females, all 21 were female. Of 8 born to the highest-ranked females, 6 were male. The offspring of those in the middle of the hierarchy had an equal sex ratio.

Other primate species produced an even greater surprise, however. Among baboons and bonnet macaques, the opposite preference prevailed: high-ranking females gave birth to female offspring, and low-ranking females gave birth to male offspring. Among the 100 births to 28 Kenyan baboon mothers studied by Jeanne Altmann of the University of Chicago, the effect was so pronounced that high-ranking females were twice as likely to have female progeny as low-ranking ones.

Subsequent studies have produced less-pronounced biases, and some scientists believe the primate results can be explained by chance. Indeed, many scientists outside evolutionary theory still distrust the whole logic of the Trivers-Willard argument. Like most "adaptive" theories, it has a circular and irrefutable

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A study of opossums undertaken to disprove theory confirmed it instead.

feel to it: because animals do something, it must be for a reason. This skepticism has been losing ground within evolutionary biology, however. The discovery that experiments can cause opossums to bias their sex ratios, and the sheer degree of bias in the monkey and deer data, have convinced most behavioral biologists that they are in the presence of a real adaptation.

Moreover, there is a good explanation for why some dominant monkeys produce more males, and others more females. In most species, males leave the troop of their birth and join another at puberty, but in spider monkeys it is the females that leave. If a monkey leaves the troop it is born into, it has no chance to inherit its mother's rank. Therefore high-ranking females will tend to have young of whatever sex stays at home, passing on the high rank to them. Low-ranking females will have young of whatever sex leaves the troop.

Here is where human beings come in. In chimpanzees, gorillas and many traditional human cultures, females leave home but males do not. In the chimpanzees studied by Jane Goodall, young males born to senior females tend to rise to the top faster than males born to junior females. Therefore, according to the Trivers-Willard logic, female apes of high social status "should" have male young.

Do "high-ranking" women (whatever that means) have more sons than daughters? One person has looked, and that was in the 1960s, before Trivers and Willard published their theory. Valerie

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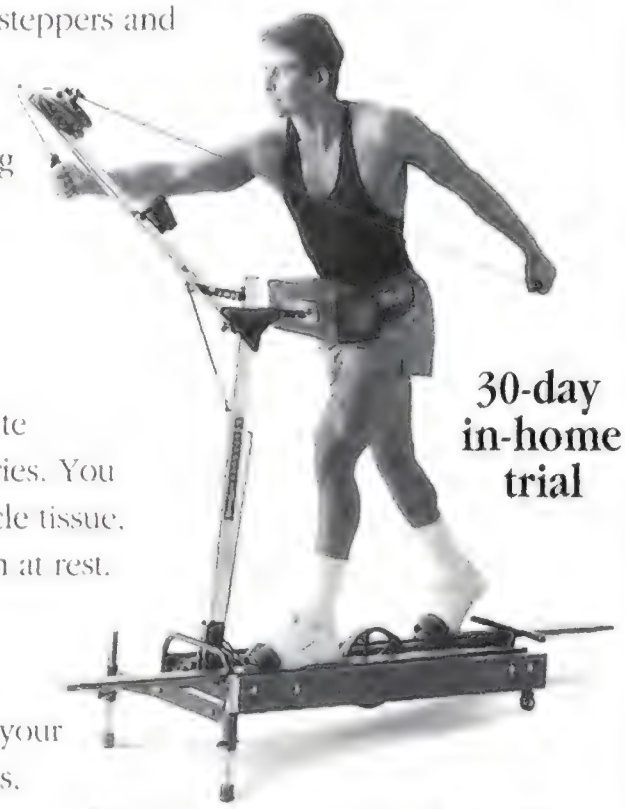

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Grant is a psychologist at the University of Auckland in New Zealand. She tested the personalities of 85 New Zealand women in the first trimester of pregnancy to determine "dominant" personalities. Those who later gave birth to daughters averaged 1.35 on the dominance scale (which runs from 0 to 6). Those who had sons scored 2.26, a highly significant difference.

Her work remains the only hint that maternal dominance (an important component of social rank in the animal world) may affect the sex of children in the way that the Trivers-Willard theory would predict. Laura Betzig of the University of Michigan has made a remarkable observation, however: America's Presidents have produced 90 sons versus 61 daughters. Presumably their wives shared their rising status from the early years of marriage.

If it is possible that women can unconsciously influence the sex of their children, how do they do it? One possibility is selective spontaneous abortion. In the case of the nutria, studied by Morris Gosling of the University of East Anglia in England, females in good

Eagles and other raptors lay female egg first so that chick will be the largest.

condition miscarry small litters if they are too female-biased and start again. So far there is no evidence of this in humans, but then no one has looked. In any event, it seems a wasteful way to proceed. Could females in some way influence the outcome of the competition between X and Y sperm?

If humans were birds, they would not have to. In birds the mother's sex chromosomes determine the sex of the egg. So a female can simply release an egg of the desired sex and let any sperm fertilize it. Bald eagles and some hawks often give birth to female eggs first and male second. This enables the female to get a head start on the male in the nest, which enables it to grow larger (in nearly all hawks, the female is larger than the male).

Physical condition of the mother is key to sex of white-tailed deer offspring.

We are not birds, however, and the sex of our offspring is determined by sperm, not eggs. William H. James of the University College London has for some years been elaborating a hypothesis that hormones can influence the relative success of X and Y sperm. He believes that the hormone gonadotrophin, which is released mainly on the day of ovulation, somehow favors X-bearing sperm. James says frequent sex leads to fertilization in an early

phase of the fertile period during low gonadotrophin levels, thus frequent sex leads to boys. And frequent sex, he continues, is characteristic of soldiers returning from war.

Valerie Grant's theory suggests a different hormonal explanation for the returning-soldier effect: women adopt more dominant roles during wars, which may affect their hormone levels and their tendency to have sons. Regardless of the details, the influence of hormones would make sense, because hormones and social status are closely related in many species, and so are social status and sex ratio of offspring.

A hormone theory would tackle one of the most persistent objections to the Trivers-Willard theory: that there seems to be no genetic control of the sex ratio. It has proved impossible to breed animals with biased sex ratios, one of the dearest goals of animal husbandry. Chicken growers employ expensive skilled labor to sort day-old chicks into males and females, while dairymen accept as a fact of life that half the young will be male and therefore useless for milk production.

As Robert Trivers, now at the University of California at Santa Cruz, himself says, if social rank controls sex ratio through hormones, then there would be no genetic control because rank is relative. "You can't breed for subordinate cows," he says. "You just create a new hierarchy and reset the thermostat. If all your cows are more subordinate, then the least subordinate will be the most dominant and have appropriate levels of hormones."

The very fact that one segment of the population is having sons makes it rewarding for another to have daughters. Every mammal is the offspring of one male and one female. So if dominant mammals are having sons, then it will pay subordinate ones to have daughters. The sex ratio of the population as a whole will always revert to 1:1, however biased it becomes in one part of the population, because if it strays from 1:1 it will pay somebody to have more of the rarer sex.

The Trivers-Willard theory predicts that evolution would build in an unconscious mechanism for altering the sex ratio of an individual's progeny. In

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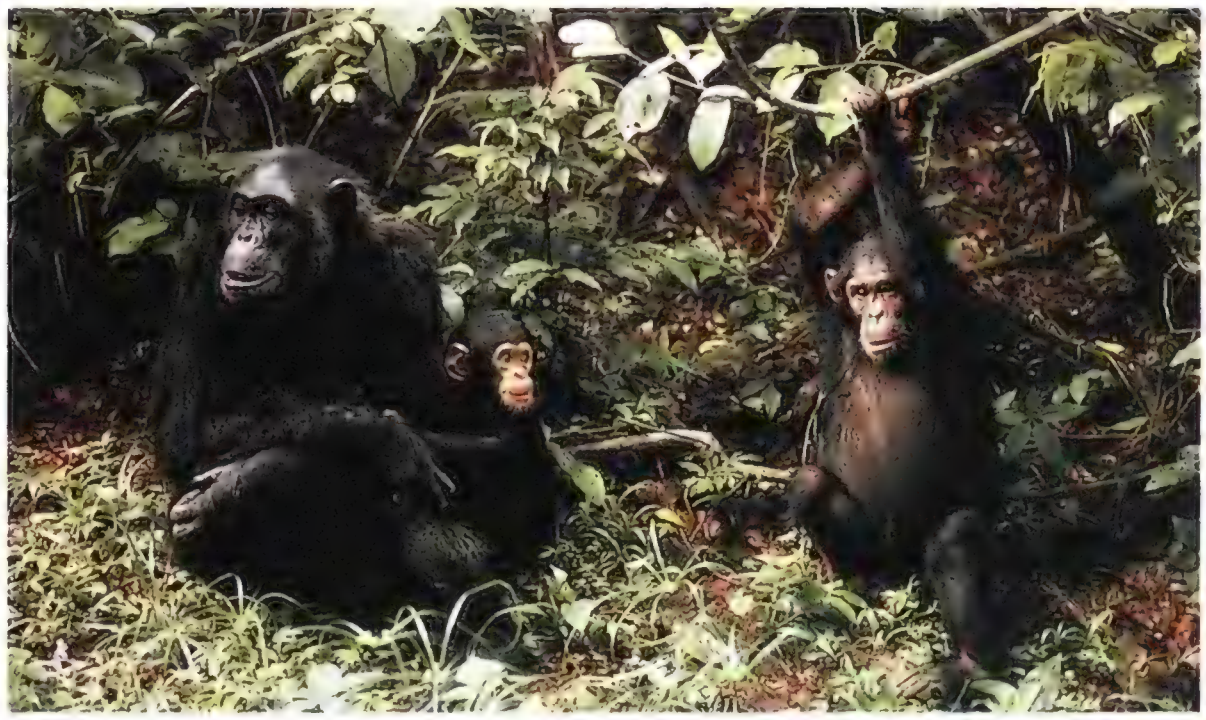
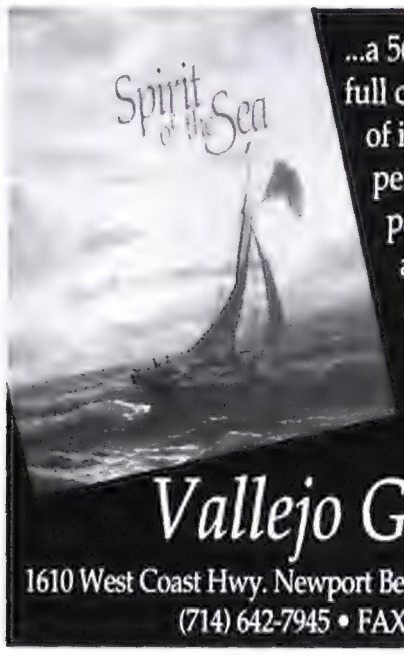


Chimpanzee social rank appears to determine the sex of offspring. Theory predicts high-status females will have more males because they stay with original group.



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some parts of the world people have for generations been biasing the sex ratio of their offspring by infanticide and have been doing so in exactly the way that Trivers-Willard predicts. This may be a coincidence, or it may be that the human psyche is just as good as evolution at calculating the genetic consequences of conscious decisions. Says Sarah Blaffer Hrdy of the University of California at Davis: "Some of the strongest data to support Trivers-Willard comes not from animals but from the human cultural rediscovery of the same logic."

Hrdy is referring to the fact that people in many cultures bias their legacies, parent care, sustenance and favoritism to sons at the expense of daughters. Until recently, this was seen as just another example of irrational sexism or the rational but cruel fact that sons often have more economic value than daughters. But by explicitly using the logic of Trivers-Willard, anthropologists have now begun to notice that male favoritism is far from universal and that female favoritism occurs exactly where you would expect it.

The higher the social status of people and the more polygamous their marriage patterns, the more likely they are to favor sons. This tendency has emerged from studies of farmers in 18th-century Germany, castes in 19th-century India, genealogies in medieval Portugal and pastoralists in modern Africa. It makes sense in two ways: first, a rich son has a chance of having more than one wife or more than one sex partner, and a polygamous son can have more offspring than any daughter; second, even in monogamous societies, sons inherit wealth and status, but daughters leave home when they marry.

Lower down the social scale, the reverse applies. A poor man is often forced to remain single. But a poor daughter can always marry a rich man. Ethnographer Lee Cronk of Texas A&M studied the Mukogodo people in Kenya, who form a kind of underclass to the Masai and Samburu people, and found they are more likely to pay to have a daughter treated by a doctor than they are for a son, and that more daughters than sons survive to the age of 4. Many Mukogodo daughters marry rich Masai and Samburu men and do well, but many sons fail to acquire even a single wife.

In some places, sexism is worsening. Anti-daughter bias in India appears to have spread to all ranks of society. Female infants of all classes now generally suffer higher mortality rates than male.

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The U.S. Department of Agriculture is experimenting with other ways to choose sex in animals when using either artificial insemination or in vitro fertilization. All involve separating X- and Y-carrying sperm, by methods familiar to chemists but until now foreign to procreation. In one, the sperm's DNA is dyed with a fluorescent compound, then exposed to a laser. The Y-bearing sperm have 3 percent to 4 percent less DNA and so fluoresce slightly less. A computer identifies them, and they are separated. The success rates of all these approaches remain controversial. Sooner or later, however, it seems likely that someone will figure out a practical method of preconception sex selection, possibly something as simple as a drug that alters hormone production.

If human beings do acquire the capacity to choose the sex of their offspring, ethical questions arise. Most

Young female spider monkeys leave group, so top mothers produce sons.

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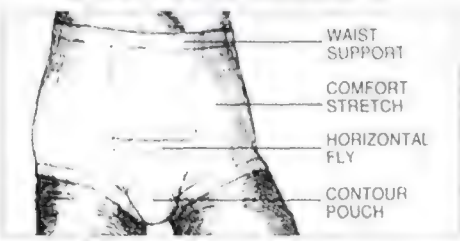

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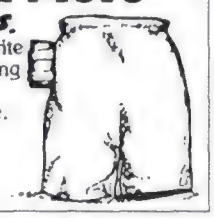

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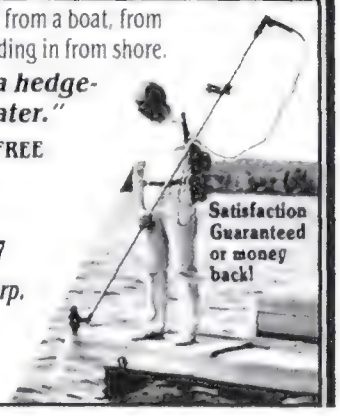

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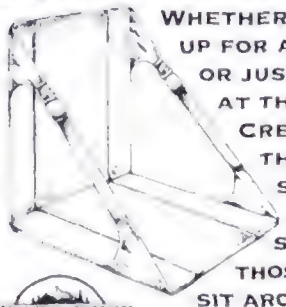
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High-ranking baboons tend to bear females, which will stay in the home group.

surveys in the United States and elsewhere show a preference for boys. Should this become practical to achieve, several things might happen. Birthrates could decline, as people would not have to keep having babies to have the sex or mix they want. The ratio of boys to girls could rise, possibly leading to men marrying at an older age and women at a younger age.

Ethical arguments against both amniocentesis followed by abortion and preconception sex selection have been presented by Dorothy Wertz of Boston University's School of Public Health and John Fletcher, director of the Center for Biomedical Ethics at the University of Virginia. Prenatal diagnosis for sex selection misuses a procedure designed to detect serious and fatal genetic diseases, they write, and is ethically unjust as it employs costly medical resources for nonmedical reasons when there are women who need medical treatment and cannot afford it. They then continue:

"Another argument against sex selection—one that anticipates completion of the human genome map—is that by selecting for sex we set precedents for attempts to select other characteristics that have nothing to do with disease, for instance, height, eye and hair color, thinness, skin color, straight teeth.... Why stop at gender selection?"

Ellen Moskowitz, at the Hastings Center (SMITHSONIAN, January 1979), an organization that studies ethical is-

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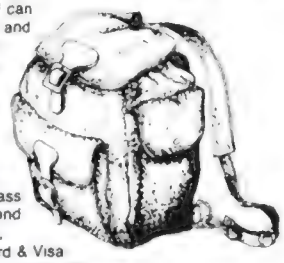
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sues in medicine, the life sciences and the professions, puts it this way: "Choosing a child like we choose a car is part of a consumerist mentality. The child becomes a 'product' rather than a full human being."

To use Garrett Hardin's analogy, sex preselection would be a "tragedy of the commons." (The phrase describes a resource held in common. It is to each individual's advantage to make maximum use of it, but when all do so the resource is destroyed.) If humans were to choose the sex of their children, each individual would benefit (by having a baby of the desired gender), but society at large would bear the cost (of a presumably disadvantageous change in the sex ratio of the population).

This will not happen while the technology is expensive and therefore available only to the elite. A rare and costly ability to select the sex of offspring does society no harm, but a cheap and widely available ability could. Bart Gledhill perhaps says it best: "It is ideal that it is expensive, difficult and not done in the privacy of the bedroom."

If humans learn to determine the sex of babies, especially before conception, ethical issues will arise. Will we choose gender the way we choose a car?

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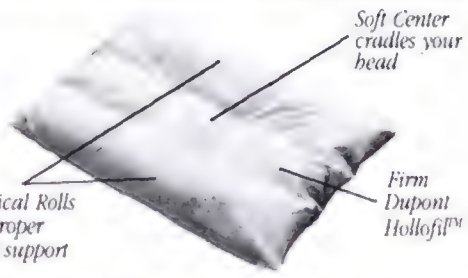

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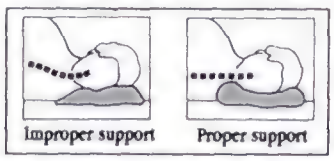

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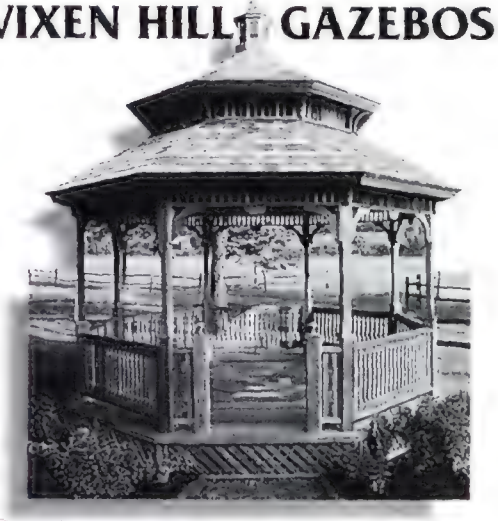

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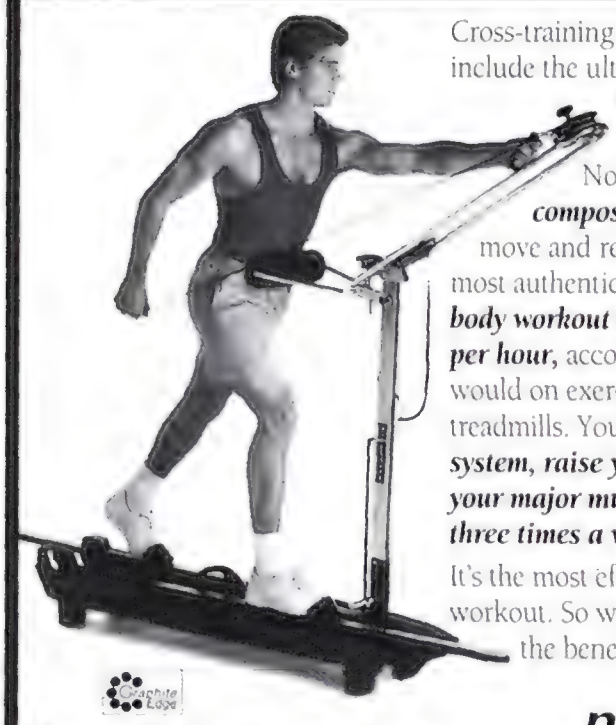

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Smithsonian horizons (p. 8)

Why Big Fierce Animals are Rare by Paul Colinvaux, Princeton University Press, 1978

"Pleistocene perspectives on coral reef community structure," *American Zoologist*, No. 6, Vol. 32, 1992

Object at hand (p. 14)

My Lord What a Morning: An Autobiography by Marian Anderson, Viking, 1956

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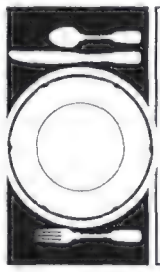

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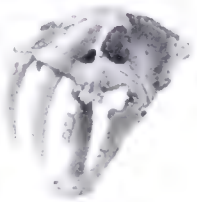

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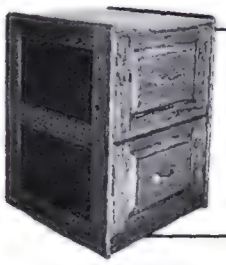

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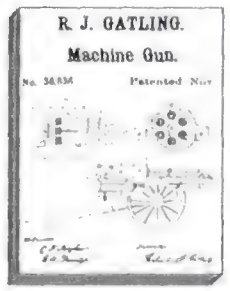

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"Why, yes, it does," I say.

"And you've abused your knees with all that gardening, you know. You need to watch that squatting and kneeling."

Then he turns, and before he can even open the drawer where he keeps his little rubber mallet, my feet both fly up and kick out, so eager are my reflexes to please Dr. Fielding. He makes me close my eyes to ensure a more reasonable reaction before he bends and gives each knee its official tap.

We go into his office for the last part of the visit, the part where I sit in the chrome-handled chair beside his desk and stare at the dusty old model skeleton and tell Dr. Fielding what's on my mind. The skeleton used to scare me when I was a little girl and my feet didn't touch the floor in this chair. But Dr. Fielding knows that it's easier to tell your troubles to a rack of bones than to a living person with flesh and blood, and staring into those dusty eye sockets I've told Dr. Fielding all kinds of things over the years, from the bizarre anxieties of adolescence to the odd delusions I had in my early 20s that I was suffering from 19th-century diseases.

"I have this little dry hacking cough. There isn't any blood in the handkerchief yet, but I wonder, could it possibly be . . . consumption?"

And a month later, meeting the skeleton's gaze quite bravely, "This rash, and a little fever . . . ," I faltered.

"What do you think it is?" inquired Dr. Fielding.

"The Pox," I whispered.

Then dizzy spells, insomnia, night sweats. "Brain fever?"

But Dr. Fielding didn't answer me. Instead he asked a question. "Do you ever read 20th-century literature? I hear that fellow John O'Hara's pretty good. You go on home now, and put those Victorian novels away. Come see me in a week if you don't feel better."

But this time I have a real problem to discuss with Dr. Fielding. Failing eyesight is forcing him to retire. This will be his last week in his office. The skeleton has come unhinged in several crucial joints and slumps disconsolately. Its head sags and it cannot meet my gaze. "Who will be my doctor now?" I ask him.

Dr. Fielding takes out a list of all the new physicians in town and checks off several names. I recognize one.

"But I taught that child in first grade!" I moan.

Another one, I happen to know, is comfortingly middle-aged, but moved here from New York and has a ponytail and a red Porsche. Several of the doctors are women. Most are specialists of one kind or another.

In the end, Dr. Fielding puts my records in my hands, a bundle of yellowed cards and folded sheets of paper held together with a rubber band. He gives me a pat and a shove. "You'll be fine," he says.

But when I get out to the waiting room my legs won't walk any farther. I sit down on the cracked vinyl sofa. All my body parts feel like lumps of lead. I try to reason with them. I wheedle and plead. I tell my uterus, "Don't worry, I'll find you a new doctor, a real gynecologist, maybe a nice lady gynecologist, who understands the special needs of women." But my uterus has gone into a kind of blue funk and does not respond.

I tell my knees, "We'll get a knee specialist, an orthopedist with laser surgery." But my knees just glare balefully into the distance. I feel a twinge of pain.

"For you," I tell my skin, "a dermatologist, with a Latin name for every itch."

"And a therapist!" I tell my brain. "A psychotherapist licensed by the state! He'll read all the magazines and keep up with the latest neuroses." But all my emotions just huddle in my head in a sodden gray mass and sulk.

I begin to understand. My whole body, having been treated by me all these years with nothing but suspicion and abuse, now wants to abandon me and stay here with its old friend Dr. Fielding, sending what's left of me, a little zephyr of consciousness, into the swirling beyond. I sit for a while and think about it. I take a deep breath. I draw myself up. Then I take a stand. After all, who's boss here?

"You are behaving like spoiled 2-year-olds," I tell my body parts. "Now get yourselves out that door."

And they do. We all step out together and stand on the porch of Dr. Fielding's office for the last time. There's the old familiar smell of the oak tree shade. A red Porsche glides down the street. It is a convertible. The top is down. The New York doctor's ponytail blows in the breeze. He gives me a confident smirk of a grin. He waves. For a second I just stand there. Nothing happens.

"Wave, sirrah!" I command my arm.

And reluctantly, but obediently, my arm rises, my hand dips once, down and up. I greet my new doctor.

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Mrs. Donivan's Kids Skate Through Science Class.

In Marilee Donivan's class, kids learn for themselves how Newton's Laws of Motion really work. They start with classroom activities using toy cars, marbles, ramps and balance scales.

Then, with the help of skates, ropes, hockey pucks and sticks, the kids put Newton's Laws to the test on the ice. They experiment with skating, spinning, sliding or walking–feeling friction and the effects of gravity.

For her contribution to the world of science, State Farm is proud to present Marilee with the Good Neighbor Award. And $5,000 to her school, McCall-Donnelly Elementary, McCall, Idaho.

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The Good Neighbor Award was developed in cooperation with the National Science Teachers Association (NSTA).